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NASA/SP—1999–7037/SUPPL398
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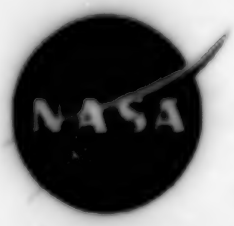

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Includes passenger and cargo air transport operations; and aircraft accidents.

04 Aircraft Communications and Navigation 7

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

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Includes aircraft simulation technology.

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Includes cockpit and cabin display devices; and flight instruments.

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Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

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Includes aircraft handling qualities; piloting; flight controls; and autopilots.

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14 Life Sciences 27

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16 Physics 36

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17 Social Sciences 38

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

18 Space Sciences N.A.

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Columbia, SC 29208
(803) 777-484* Fax (803) 777-9503

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Typical Report Citation and Abstract

1. 19970001126 NASA Langley Research Center, Hampton, VA USA
2. Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
3. Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
4. Mar. 1996; 130p; In English
5. Contract(s)/Grant(s): RTOP 505-68-70-04
6. Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

7. To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
8. Author
9. *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 398)

APRIL 16, 1999

01
AERONAUTICS

19990025488 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 396
Mar. 19, 1999; 53p; In English
Report No.(s): NASA/SP-1999-7037/SUPPL396; NAS 1.21:7037/SUPPL396; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-1999-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. Two indexes-subject and author are included after the abstract section. CASI

Bibliographies; Aerodynamics; Aeronautical Engineering; Indexes (Documentation)

19990026308 University Aviation Association, Auburn, AL USA
Collegiate Aviation Review *Final Report*
Lefurer, Henry R., Editor, Nebraska Univ., USA; Carstenson, Larry, Editor, Nebraska Univ., USA; Carney, Thomas Q., Editor, Purdue Univ., USA; Barker, Ballard M., Editor, Florida Inst. of Tech., USA; Bowen, Brent D., Editor, Nebraska Univ., USA; Chubb, Gerald P., Editor, Ohio State Univ., USA; Envick, Robert M., University of Central Washington, USA; Green, Mavis F., Editor, Illinois Univ. at Urbana-Champaign, USA; Harrat, Abe, Editor, Embry-Riddle Aeronautical Univ., USA; Luedtke, Jacqueline, Editor, Utah State Univ., USA; NewMyer, David A., Editor, University of Southern Illinois, USA; Northam, Gary J., Editor, Saint Louis Univ., USA; September 1997; 57p; In English; 1997 Fall Education, 1997, Unknown; See also 19990026309 through 19990026313
Report No.(s): Rept-1997; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The collegiate Aviation Review is published annually by the University Aviation Association and is distributed to the members of the association. Papers published in this volume were selected from submissions which were subjected to a peer blind review process and were presented at the 1997 Fall Education Conference of the Association. Contents include the following: An examination of the US policy regarding child restraint systems. Advanced qualification training: a study of implementation of CRM into airline training. The theory of functionalism and the international civil aviation organization (ICAO): an analytical assessment after the first fifty years. Student performance in the technology-enhanced aviation meteorology course. Educational requirements for a career in airline management: an industry perspective.
Author

Policies; Occupation; Qualifications; Airline Operations

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery

19990025326 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
International Conference on the Methods of Aerophysical Research 1998 "ICMAR 1998", Part 3, Proceedings
Jan. 1998; 308p; In English
Contract(s)/Grant(s): F61775-98-WE002
Report No.(s): AD-A359009; EOARD-CSP-98-1025; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The Final Proceedings for International Conference on Methods of Aerophysical Research (ICMAR 1998), 29 June 1998 - 3 July 1998. This is an interdisciplinary conference. Topics include: Problems of Modeling at sub/trans/super/hypersonic velocities; Methods of flow diagnostics; Instrumentation for aerophysical experiments; Verification of CFD models and methods.
DTIC
Conferences; Computational Fluid Dynamics; Atmospheric Physics; Gas Dynamics; Supersonic Combustion Ramjet Engines

19990025485 Royal Aeronautical Society, London UK
Third Test and Evaluation International Aerospace Forum: the Management and Technology Trends of Ranges and Facilities into the 21st Century
Jun. 24, 1998; 131p; In English; Conference proceedings for Test and Evaluation International Aerospace Forum (3rd), 23 Jun 98.
Report No.(s): AD-A358857; EOARD-CSP-98-1013; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The Final Proceedings for Third Test and Evaluation International Aerospace Forum, 23 June 1998 - 25 June 1998. What do we need to test, and what facilities do we have? Management changes of test facilities; Technical changes of test facilities; Future test technology needs; Test technology solutions for the 21st Century.
DTIC
Conferences; Management Systems; Technology Assessment; Ranges (Facilities); Test Facilities; Aerospace Systems

19990025632 Wallace (Lane E.), USA
The Whitcomb Area Rule: NACA Aerodynamics Research and Innovation, Chapter 5
Wallace, Lane E., Wallace (Lane E.), USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 135-148; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The breaking of the "sound barrier" gave an impetus to the designing of the next generation aircraft that could operate at supersonic speeds. But preliminary tests of models indicated that even the best designs put forth by industry engineers were not going to achieve that goal. A sharp increase in drag at speeds approaching Mach One was proving too much for the limited power jet engines to overcome. The solution to this impasse was found by Richard T. Whitcomb who developed the "area rule". This revolutionized how engineers looked at high-speed drag and impacted the design of virtually every transonic and supersonic aircraft built.
CASI
Acoustic Velocity; Aerodynamics; Supersonic Speed; Transonic Speed; Supersonic Drag

19990026159 Army Aviation and Missile Command, Aeroflightdynamics Directorate, Hampton, VA USA
Aerodynamic Flow Field Measurements for Automotive Systems
Hepner, Timothy E., Army Aviation and Missile Command, USA; January 1999; 190p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 522-31-61-01
Report No.(s): NASA/TM-1999-208965; L-17793; NAS 1.15:208965; AFDD/TR-99-A-002; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The design of a modern automotive air handling system is a complex task. The system is required to bring the interior of the vehicle to a comfortable level in as short a time as possible. A goal of the automotive industry is to predict the interior climate of an automobile using advanced computational fluid dynamic (CFD) methods. The development of these advanced prediction tools will enable better selection of engine and accessory components. The goal of this investigation was to predict methods used by the automotive industry. To accomplish this task three separate experiments were performed. The first was a laboratory setup where laser velocimeter (LV) flow field measurements were made in the heating and air conditioning unit of a Ford Windstar. The second involved flow field measurements in the engine compartment of a Ford Explorer, with the engine running idle. The third mapped the flow field exiting the center dashboard panel vent inside the Explorer, while the circulating fan operated at 14 volts. All three experiments utilized full-coincidence three-component LV systems. This enabled the mean and fluctuating velocities to be measured along with the Reynolds stress terms.
Author
Aerodynamic Characteristics; Air Conditioning Equipment; Automobiles; Computational Fluid Dynamics; Flow Distribution; Reynolds Stress; Flow Visualization; Velocity Measurement; Flow Measurement

19990826197 Naval Postgraduate School, Monterey, CA USA
Computational Investigation of Subsonic Torsional Airfoil Flutter
Kakkavas, Constantinos; Dec. 1998; 110p; In English
Report No.(s): AD-A359731; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In this thesis single-degree-of-freedom torsional airfoil flutter is investigated using an incompressible potential flow code, a compressible inviscid Euler code and a compressible viscous Navier-Stokes code. It is found that the classical linearized incompressible and compressible flow theories yield unconservative flutter estimates. The computations based on the non-linear codes show for NACA 0006, NACA 0009, NACA 0012 and NACA 0015 airfoils, that the regions of torsional flutter instability increase as the airfoil thickness and the flight Mach number is increased. On the other hand, the comparison of the flutter boundaries computed with the viscous Navier-Stokes code versus the inviscid Euler code shows that the effect of viscosity is stabilizing. Also, the computed flutter boundaries display the effect of pitch axis location on flutter. Axis locations in the range between half a chord upstream of the leading edge of the airfoil and the leading edge are most prone to induce flutter. Axis locations downstream of the quarter chord are flutter free.
DTIC

Airfoils; Compressible Flow; Inviscid Flow; Incompressible Flow; Airfoil Profiles; Euler Equations of Motion; Navier-Stokes Equation; Subsonic Flutter; Potential Flow

19990826234 Office National d'Etudes et de Recherches Aerospatiales, Paris, France
Pressure sensitive paints: Application in wind tunnels *Peintures Sensibles a la Pression: Application en Soufflerie Aerodynamique*
Mebarki, Youssef, Office National d'Etudes et de Recherches Aerospatiales, France; 1998; ISSN 0078-3781; 290p; In French; Original contains color illustrations
Report No.(s): ONERA-NT-1998-6; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Pressure Sensitive Paint (PSP) is a recent technology based on oxygen quenching of organic luminescence. This technique, applied on aerodynamic testing, allows the measurement of pressure distribution over the model surface. The objective of this study, carried out at the Aerodynamics Department of ONERA, is the definition and the application of a PSP system in the field of steady aerodynamics. The parameters involved in the PSP technique have been analysed and the main sources of errors have been described: temperature and illumination variations. The research of luminescent compounds has resulted in a set of two original sensors. The first one, based on pyrene, is nearly insensitive to temperature fluctuations on the model, while the second one is a mixture of Temperature (TSP) and Pressure Sensitive Paint (PSP): it allows the measurement of pressure and temperature. A general approach has lead to a description of the point behaviour, which takes into account different wind tunnel test conditions (i.e. pressure and temperature). Tests in transonic wind tunnels were carried out under different flow conditions and various data processing: in-situ calibration, measurements without pressure taps and local pressure and temperature measurements using the PSP-TSP point. The application in a hypersonic facility is introduced using the pyrene-based paint.
Author

Atmospheric Temperature; Pressure Distribution; Pressure Measurement; Wind Tunnels; Wind Tunnel Tests; Paints

19990826445 Air Force Test Pilot School, Edwards AFB, CA USA
Change in Range Factor as a Result of an Application of an Aviation Polish to a T-38A Aircraft (HAVE SLICKER) *Final Report, 16 Mar. - 9 Apr. 1998*
Tavares, Ernest S., Jr.; Fitz, Eric P.; Kligman, Jeffery T.; Elledge, Alan; Keat, Neo H.; Nov. 1998; 72p; In English
Contract(s)/Grant(s): Proj-M96J
Report No.(s): AD-A360054; AFFTC-TR-98-05; AFFTC-TR-98-05; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report presents the results of an evaluation of a change in range factor as a result of an application of Racer's Edge polish to a T-38A aircraft (HAVE SLICKER). The objective of this effort was to characterize potential range factor (true airspeed multiplied by aircraft gross weight divided by fuel flow) changes as a result of the polish application. Testing was conducted by the USAF Test Pilot School Class 97B at Edwards AFB, California, from 16 March to 9 April 1998. Testing was requested by the Air Force Flight Test Center Single Face to Customer Office, at Edwards AFB, and was conducted under a Cooperative Research and Development Agreement number CR980100.
DTIC

Flight Tests; Aircraft Engines; T-38 Aircraft

19990026613 Innovative Scientific Solutions, Inc., Beavercreek, OH USA

Development of Filtered Rayleigh Scattering Velocimetry for Wind Tunnel Application *Final Report, 14 Apr. 1997 - 13 Jan. 1998*

Carter, C. D.; Feb. 1998; 22p; In English

Contract(s)/Grant(s): F33615-97-C-3004; AF Proj. 3005

Report No.(s): AD-A359849; AFRL-VA-WP-TR-1998-3092; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this SBIR program was to develop a FRS (filtered Rayleigh scattering) velocimetry instrument for the study of unsteady flow fields. During Phase I we constructed a single-velocity-component device for use with a single-mode Q-switched Nd:YAG laser. This FRS device included a custom wavemeter for recording accurately the laser wavelength on each pulse, two 16-bit, back-illuminated CCD cameras, and custom Windows-95 software for integrating the wavemeter and cameras. Initially, we tested and debugged the FRS system using a supersonic (Mach 1. 36) axisymmetric jet. These tests demonstrated that accurate mean (within 5%) and instantaneous (within 4%) velocities can be obtained with this technique. Subsequent to these tests, we implemented the FRS velocimetry instrument in the SARL (Subsonic Aerodynamic Research Laboratory) wind tunnel to test the feasibility of applying this advanced instrumentation in a realistic large-scale tunnel facility. We investigated the flow over a delta-wing model with and without tail fins; here, the freestream velocity compared well to the value derived from pitot probes, while FRS measurements over the delta wing provided new insight into complex, unsteady flows. Potential applications include the timely and cost-efficient testing of novel aerodynamic concepts and designs in large-scale wind tunnels.

DTIC

Rayleigh Scattering; Velocity Measurement; Subsonic Wind Tunnels; Unsteady Flow; Free Flow; Laser Applications

19990026618 Air Force Research Lab., Air Vehicles Directorate, Wright-Patterson AFB, OH USA

Characterization of the Flowfield Near a Wrap-Around Fin at Supersonic Speeds *Final Report, 1 Oct. 1995 - 1 Mar. 1997*

Tilmann, Carl P.; Feb. 1998; 147p; In English

Contract(s)/Grant(s): Proj-2404

Report No.(s): AD-A359861; AFRL-VA-WP-TR-1998-3058; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A wall-mounted semi-cylindrical model fitted with a single wrap-around in (WAF) has been investigated numerically and experimentally, with the objective of characterizing the mean and turbulent flowfield near a WAF in a supersonic flowfield. Numerical and experimental results are used to determine the nature of the flowfield and quantify the effects of fin curvature on the character of the flow near WAFs. This research has been motivated by the need to identify possible sources of a high-speed rolling moment reversal observed in sub-scale flight tests. Detailed mean flow and turbulence measurements were obtained in the AFIT Mach 3 wind tunnel using conventional probes and cross-wire hot-film anemometry at a series of stations upstream of and aft of the fin shock/boundary layer interaction. Hot-film anemometry results showed the turbulence intensity and Reynolds shear stress in the fuselage boundary layer to be far greater on the concave side of the fin than on the convex side. Mean flow was also obtained in the AFIT Mach 5 wind tunnel using conventional pressure probes. Numerical results were also obtained at the test conditions employing the algebraic eddy viscosity model of Baldwin and Lomax. Correlation with experimental data suggests that the calculations have captured the flow physics involved in this complicated flowfield. The calculations, corroborated by experimental results, indicate that a vortex exists in the fin/body juncture region on the convex side of the fin. This feature is not captured by the oft-used inviscid methods, and can greatly influence the pressure loading on the fin near the root.

DTIC

Cylindrical Bodies; Flow Distribution; Flow Measurement; Hypersonic Speed; Inviscid Flow; Turbulent Flow; Wind Tunnel Models; Fins; Wind Tunnel Tests

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19990025474 Naval Postgraduate School, Monterey, CA USA

Contract Logistics Support (CLS) in the Twenty First Century: A Comparative Analysis of CLS in the T-45 Program Using NAMP/4790 Procedures Vice Commercial Best Practices

Haberthur, Michael T.; Dec. 1998; 72p; In English

Report No.(s): AD-A359115; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This thesis evaluates the current USA Navy (USN) Contract Logistics Support (CLS) arrangement on the T-45TS program and compares it to commercial best practices. The objective was accomplished by evaluating the existing system and using techni-

cal functional and operational analyses to determine the feasibility of improving USN practice in contract methodology and language for future CLS implementations in general and on the T-45TS program in particular. Using archival research, interviews, and site visits, this study identifies the current system and state of the art commercial best practices in service contracts and contracting/quality control oversight applicable to USN CLS implementation. Broad findings include: competitively bidding a contract without owning the engineering data rights may be costly in the long run; that infusion of best commercial practices and international quality standards vice strict compliance with government practices provides an opportunity to decrease life cycle costs through reduced oversight and state of the art management techniques and processes. Further findings and recommendations on specifically improving the T-45TS program are included in the areas of: Improving Contract Practices, Personnel Qualifications, and Training.

DTIC

Human Factors Engineering; Personnel; Management Methods; Functional Analysis; Personnel Development

19990025638 Prologue Group, Redwood City, CA USA

Lew Rodert, Epistemological Liaison, and Thermal De-Icing at Ames, Chapter 2

Bugos, Glenn E., Prologue Group, USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 29-58; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A paradox in aircraft icing research took the National Advisory Committee for Aeronautics (NACA) further into actual aircraft design than it had ever before ventured, to gather data on new de-icing equipment under natural icing conditions, and do so safely. NACA needed an aircraft already vulnerable to the dangers of icing. So Lewis A. Rodert, leader of NACA icing research from 1936 to 1945, built his own de-icing system on two aircraft-first a small Lockheed 12A and next a Curtiss C-46 transport that would become flying laboratories for further research. When Rodert received his Collier Trophy in December 1947, the practicality of his innovation had hardly been established. As evidence of practicality, the press release noted only that his specially-modified C46 flew through the weather that grounded other aircraft. Manufacturers had begun building similar de-icing systems, though few followed Rodert's suggestions. Still, despite the narrow practicality of Rodert's work, he was indeed largely responsible for getting industry off its duff. The Collier Trophy testified to the peculiar and fruitful synergism of his personality with the NACA advisory committee form of research.

Derived from text

Aircraft Design; Aircraft Icing; Deicers; Deicing; Ice Formation; Wind Tunnel Tests; Aerodynamic Heat Transfer

19990025651 Federal Aviation Administration, Airport and Aircraft Safety Research and Development, Atlantic City, NJ USA

Fire-Resistant Materials *Final Report*

Lyon, Richard E., Editor; Nov. 1998; 294p; In English

Report No.(s): AD-A359299; DOT/FAA/AR-97/100; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This report details the research being conducted by the Federal Aviation Administration (FAA) to develop fire-safe cabin materials for commercial aircraft. The objective of the Fire-Resistant Materials program is to eliminate burning cabin materials as a cause of death in aircraft accidents. Long-term activities include the synthesis of new, thermally stable, low fuel value organic and inorganic polymer systems. The synthesis effort is supported by fundamental research to understand polymer combustion and fire resistance mechanisms using numerical and analytic modeling and the development of new characterization techniques. Aircraft materials which are targeted for upgraded fire resistance are (1) thermoset resins for interior decorative panels, secondary composites, and adhesives; (2) thermoplastics for decorative facings, telecommunication equipment, passenger service units, molded seat parts, transparencies, and electrical wiring; (3) textile fibers for upholstery, carpets, decorative murals, tapestries; and (4) elastomers/rubber for seat cushions, pillows, and sealants. During the first 2 years of the program (1995-1996) we have made significant progress in achieving our interim goal of a 50 percent reduction in the heat release rate of cabin materials by 2005 and zero heat release rate cabin materials by 2018 with respect to the 1996 baseline for new aircraft. A previous report, Fire-Resistant Materials: Research Overview, DOT/FAA/AR-97/99, summarizes the background and technical objectives of the program and serves as an introduction to the present document.

DTIC

Thermal Stability; Thermoplastic Resins; Sandwich Structures; Heat Transfer; Flame Retardants; Aircraft Accidents; Characterization; Elastomers

19990025959 Naval Postgraduate School, Monterey, CA USA
The Marine Corps Flying Hour Program at Marfortlant
Garner, Edward C.; Dec. 1998; 131p; In English
Report No.(s): AD-A358803; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The goal of this thesis is to determine the best way to manage the Flying Hour program (FHP) from the perspective of the U.S. Marine Forces Atlantic (MARFORLANT) Aviation Budget Officer. The thesis has two main objectives. The first objective is to describe the organization and current financial management issues related to the FHP at the Department of the Navy (DON) and MARFORLANT levels. An historical overview of the FHP, an analysis of federal and defense budgeting dynamics, and an impact analysis of the Marine Aviation Campaign Plan are provided. The second objective is to conduct quantitative analysis of selected MARFORLANT data to better understand FHP cost behavior. Regression results are compared with previous DON research to determine the suitability of Cost Per Hour as the most reliable FHP metric. Analysis confirmed that there is a direct relationship between fuel and flight hours, but showed virtually no correlation between flight hours and aviation maintenance costs. These findings indicate that regression models show too much variability for them to be used to displace the DON OP-20 model as the primary means for budget forecasting for the FHP. The thesis concludes that the /Aviation Budget Officer must continue to rely on qualitative budgeting skills to maximize the financial condition of MARFORLANT Aviation.
DTIC
Aircraft Maintenance; Budgeting; Correlation; Financial Management; Histories

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19990026309 Nebraska Univ., Kearney, NE USA
An Examination of the US Airline Policy Regarding Child Restraint Systems
Carstenson, Larry, Nebraska Univ., USA; Sluti, Donald, Nebraska Univ., USA; Luedtke, Jacqueline, Utah State Univ., USA; Collegiate Aviation Review; September 1997, pp. 1-12; In English; See also 19990026308; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study examined the policy of the U.S. commercial air carriers regarding the use of infant restraint systems on aircraft. The study determined whether airline management and airline personnel understand that policy and whether that policy is effectively communicated to the traveling public. This study investigated the effectiveness of communication between airline management and airline personnel regarding airline policy for the carriage of infants in commercial airplanes. The results of this survey were analyzed in order to determine if any recommendations could be made to the airlines regarding child restraint systems on commercial aircraft.
Author
Examination; Airline Operations; Policies; Child Device

19990026310 University of Central Washington, Ellensburg, WA USA
Advanced Qualification Training: A Study of Implementation of CRM into Airline Training
Matteson, Roger C., University of Central Washington, USA; Collegiate Aviation Review; September 1997, pp. 13-18; In English; See also 19990026308; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The emphasis in training pilots on today's aircraft is placed on preparing the crew to interact with each other and to recognize any problem that may occur long before such a problem becomes a flight hazard. The training that is necessary to do this is called Crew Resource Management (CRM). Although CRM has been used by the airlines for about the past ten years, no integrated training among the airlines has been formulated until recently. Recent pressure from outside sources has prompted the FAA to initiate action to formalize CRM training in the airlines. The Federal Aviation Administration (FAA) established Special Federal Aviation Regulation (SFAR) 58, which created the Advanced Qualification Program (AQP) (Federal Aviation Administration, 1990). This allowed the airlines to develop their own training program which incorporates CRM and Line Operational Simulations (LOS). LOS utilizes simulator training using a typical operational passenger flight scenario, in a controlled training environment. It is designed to improve cockpit/cabin communication and coordination skills, and pilot decision-making skills (Federal Aviation Administration, 1995).
Author
Airline Operations; Civil Aviation; Training Aircraft; Training Simulators; Education; Decision Making; Coordination

19990026322 Aeronautical Systems Div., Wright-Patterson AFB, OH USA
Corrosion and Fatigue: Safety Issue or Economic Issue
Lincoln, John W., Aeronautical Systems Div., USA; Fatigue in the Presence of Corrosion; March 1999; 5p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A01, Hardcopy; A03, Microfiche

Corrosion and fatigue separately have both led to serious safety as well as economic problems. Corrosion alone, in forms such as uniform corrosion or exfoliation, may reduce the strength of aircraft and lead to failure. Both of these forms of corrosion may lead also to expensive component repair or replacement. There are many cases where corrosion alone is not significant from a safety consideration, but is a very significant economic problem. In the case of corrosion alone, one must judge the seriousness of this problem on an individual basis. Nondestructive inspections have found fatigue problems where there is essentially no influence from corrosion. Researchers have documented many cases over the years where the consequences were catastrophic. The results of fatigue cracking have caused many expensive repairs and modifications to the structure including component replacement. Fatigue often combines synergistically with corrosion. In these cases, the term corrosion fatigue is more appropriate. In most cases, corrosion, fatigue, or corrosion fatigue becomes a safety consideration only when either maintenance is not performed properly or the maintenance program is inappropriate. Experience derived from diligent maintenance has repeatedly shown that the operator need not compromise safety resulting from these problems. The purpose of this paper is to describe some experiences with corrosion, fatigue, and corrosion and fatigue and to review some of the relative literature on this subject.
Author
Fatigue (Materials); Corrosion; Structural Failure; Aircraft Maintenance; Aircraft Structures; Nondestructive Tests; Inspection; Corrosion Tests; Fatigue Tests

19990026441 Naval Postgraduate School, Monterey, CA USA
Automating the Aviation Command Safety Assessment Survey as an Enterprise Information System (EIS)
Held, Jonathan S.; Mingo, Fred J., Jr.; Mar. 1999; 319p; In English
Report No.(s): AD-A360024; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The Aviation Command Safety Assessment (ACSA) is a questionnaire survey methodology developed to evaluate a Naval Aviation Command's safety climate, culture, and safety program effectiveness. This survey was a manual process first administered in the fall of 1996. The primary goal of this thesis is to design, develop, and test an Internet-based, prototype model for administering this survey using new technologies that allow automated survey submission and analysis. The result of this thesis is a web site http://spitfire.avsafety.nps.navy.mil that adheres to a three-tier client/server architecture. The back-end SQL server database used to store survey information is accessed via front-end Java applets or Hypertext Markup Language (HTML) forms. Middleware components that complete the connection between client and server include Weblogic's Fastforward JDBCTM driver and Java servlets. The ACSA web site utilitizes many Internet technologies: Active Server Pages (ASP), HTML, Javascript, Active X, Secure Sockets Layer (SSL), COI scripts, JDBCTM, and Java applets and servlets. This thesis leads the reader through the research and development process describing how each of these technologies is used. Thorough review of this material is necessary for lifecycle support and fiiture project revisions. Complete source code can be found in the appendices.
DTIC
Client Server Systems; Data Bases; Aircraft Safety; Flight Safety; Information Systems

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19990026081 Civil Aeromedical Inst., Oklahoma City, OK USA
Reduced Flight Process Strips in En Route ATC Mixed Environments *Final Report*
Durso, Francis T., Oklahoma Univ., USA; Truitt, Todd R., Oklahoma Univ., USA; Hackworth, Carla A., Oklahoma Univ., USA; Albright, Chris A., Oklahoma Univ., USA; Bleckley, M. Kathryn, Oklahoma Univ., USA; Manning, Carol A., Civil Aeromedical Inst., USA, Oct. 1998; 26p; In English
Contract(s)/Grant(s): DTFA-02-93-D-93088
Report No.(s): DOT/FAA/AM-98/26; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Currently, en route control of high altitude flights between airports uses computer-augmented radar information available on the Plan View Display (PVD), Computer Readout Device (CRD), and flight information printed on Flight Progress Strips (FPSs). The FPS contains thirty-one fields that supplement data available on the PVD. While an aircraft is in a controller's sector, control instructions, changes to the flight plan, and other contacts with the aircraft are written on the corresponding strip. This report describes an experiment that compared the effects of using a standard-sized (1 and 5/16" x 8") FPS, a reduced FPS (1" x 5") and information on the performance and workload of controller teams. The teams, from Minneapolis ARTCC, controlled simulated air traffic in a mixed radar-non-radar environment. Overall, the 1" x 5" reduced strip yielded deficits in the control of nonradar flights but not radar flights. This was evidenced in subject matter experts' evaluation of non-radar separation, strip

processing and board management, and, to a marginal extent, in the efficiency of traffic movement through the sector. The radar-side (R-side) controller's awareness was also rated lower when using the smaller strips. Interestingly, the controllers' evaluation of their own performance did not reflect a difference between smaller and normal-sized strips. This may help explain why controllers did not compensate for the smaller strips to any great extent. Only R-side controllers exhibited compensatory behaviors and reported increased workload. R-side controllers also pointed to the PVD more often. Although there was little compensatory activity, R-side Controllers thought workload was greater with smaller strips. R-side controllers also felt it was more effortful and more frustrating working with the 1" x 5" strips. Despite the self-reported heavier workload, controllers nevertheless were able to perform secondary tasks, such as granting pilot requests, as often and as quickly using smaller strips as they did using standard strips. This study also described specific air traffic activities likely to be affected by a reduction to a 1" x 5" FPS. Strip marking, speed of strip processing, and some aspects of board management seemed especially affected. Inferior strip marking was evidenced in the on-line expert evaluation and controllers often reported that the size of the 1" x 5" strip prevented writing. The ability to locate a particular strip and find the information on it seems to suffer with a reduction in size as tested in this study. On-line expert evaluations and controller opinions echoed this problem. Locating strips might have been especially difficult for the R-side, thus leading to large differences in self-reported frustration. Controllers also noted specific problems with the strip display, including the use of shading to replace information typically presented in red. of board management responsibilities, considered by controllers as generally inferior with 1" x 5" strips, removal of deadwood seems less likely to be negatively affected by reduction in strip size. The on-line expert evaluation rated the 1" x 5" strips negatively and the subject matter experts recorded more negative comments about removal of deadwood under that condition. Overall, this study does not permit recommendation of the 1" x 5" reduced strip as designed for this study. Suggestions for improving a less than standard size FPS are provided.

Author

Flat Panel Displays; Automated En Route ATC; Radar Approach Control; Flight Management Systems; On-Line Systems; Air Traffic Controllers (Personnel)

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology

19990025571 Northeastern Univ., Boston, MA USA

The X-15 Hypersonic Flight Research Program: Politics and Permutations at NASA, Chapter 6

Kay, W. D., Northeastern Univ., USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 149-164; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two features of the X-15 program, an outstanding piece of machinery flown by exceptionally brave and skilled pilots stand as the legacy of the program. The problem with the prevailing view is not so much that it is wrong but that it is incomplete. The program has been extolled for the contributions to aerospace engineering. However little has been written about its overall management, and the difficulties which had to be overcome. This chapter tells of the program to develop the X-15, and the administrative achievements in the light of the technical problems. It examines the administrative and political factors that played a role in the success.

CASI

Hypersonic Flight; Aerospace Engineering; X-15 Aircraft

19990025572 Auburn Univ., Dept. of History, AL USA

Engineering Science and the Development of the NACA Low-Drag Engine Cowling, Chapter 1

Hansen, James R., Auburn Univ., USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 1-27; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The agency, that preceded NASA, the National Advisory Committee for Aeronautics (NACA), won its first of five Collier Trophies in 1929, and did so basically for advancing a couterintuitive idea. The idea, which flew in the face of a conventional wisdom about proper aircraft design, ventured the following: covering up --not leaving open to the air -- the cylinders of an air-cooled radial engine could not only dramatically reduce aerodynamic drag but actually, improve engine cooling. The immediate product of this startling engineering insight was the NACA's development of a low-drag engine "cowling," the winner of the 1929 Collier Trophy. Put simply the NACA cowling was a metal shroud for a radial air-cooled engine. As the essay intends to show, the technological process represented in the NACA's cowling investigation was of a particular type that has often proved funda-

mental to progress not only in aviation but in all engineering fields. It was not the path of inspired genius the public had come to want, but neither was it meer development. Rather, the NACA cowling was something more fundamental and harder to identify, let alone comprehend. It was the fruitful product at a government lab of what historians of technology have come to call engineering science.
Derived from text
Aerodynamic Drag; Air Cooling; Aircraft Design; Cowlings; Product Development; Aeronautical Engineering; Histories

19990025634 Maryland Univ., Dept. of Aeronautical Engineering, College Park, MD USA
Research in Supersonic Flight and the Breaking of the Sound Barrier, Chapter 3
Anderson, John D., Jr., Maryland Univ., USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 59-90; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The National Advisory Committee for Aeronautics' (NACA) work on high speed aerodynamics described in this chapter is also one of the early examples in the history of aerodynamics where engineering science played a deciding role. In this chapter we shall see that NACA researchers in the 1920's and 1930's were working hard to discover the scientific secrets of high-speed aerodynamics just so they could properly design airfoils for high-speed flight. Also within the general framework of the historical evolution of aerodynamic thought over the centuries, the NACA's highspeed research program is among the earliest examples of engineering science.
CASI
Acoustic Velocity; Aerodynamics; Airfoils; Supersonic Flight; Transonic Flight; Compressible Flow; Propellers

19990025936 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA
Testing and Evaluation of the Mine Safety Appliances, Co., Model 3000, Oxygen Monitor *Final Report*
Sylvester, James C.; Nov. 1998; 16p; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A359546; AFRL-HE-BR-TR-1998-0120; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Mine Safety Appliances, Co., Model 3000, Oxygen Monitor is an oxygen monitor designed to provide continuous, direct monitoring of oxygen mixtures. The unit operates on a 9V internal battery. The unit weighs approximately 260 Gm or 9.2 oz. and is 3.25 in. W. X 5.98 in. H. X 1.31 in D.
DTIC
Oxygen Supply Equipment; Evacuating (Transportation); Medical Equipment; Oxygen

19990025938 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Structural Investigation of the F-14 TARPS CD Pod
Pratt, Jack B.; Jan. 07, 1999; 16p; In English
Report No.(s): AD-A359550; NAWCADPAX--99-7-SAR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of a structural evaluation of the Tactical Air Reconnaissance Pod System (TARPS) completely digital (CD) pod for demonstration flights on the F-14 aircraft. Based upon evaluation presented in this report, it is recommended the TARPS CD pod be authorized for flight test to the current F-14 NATOPS limits when configured with a standard TARPS pod, including carrier suitability operations.
DTIC
F-14 Aircraft; Structural Analysis; Flight Tests; Pods (External Stores); Reconnaissance Aircraft; Aerial Reconnaissance

19990025946 Logicon Technical Services, Inc., Dayton, OH USA
SEAD and the UCAV: A Preliminary Cognitive Systems Analysis *Interim Report, May 1997 - Feb. 1998*
Flach, John M.; Eggleston, Robert G.; Kuperman, Gilbert G.; Dominguez, Cynthia O.; Feb. 1998; 58p; In English; Prepared in cooperation with Wright State Univ., Fairborn, OH.
Contract(s)/Grant(s): F41624-94-D-6000; AF Proj. 7184
Report No.(s): AD-A358833; AFRL-HE-WP-TR-1998-0013; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report is the first step of a program with three explicit goals: (1) to illustrate and test the framework of Cognitive Systems Engineering (CSE) for use in military systems analysis and design; (2) to generate a database that will be useful for designers and managers working on the development of UCAVs for use in the SEAD mission; and (3) to develop interfaces for UCAVs. These goals are tightly coupled in that the usefulness of the database and the ability to develop effective interfaces and user-aiding concepts will be the true test of the CSE framework. The report is most relevant to the second goal. It provides a CSE framework for

interpreting and organizing data generated from cognitive task analyses of the SEAD mission. The CSE framework is unique in that it develops a holistic approach to human-socio-technical systems. It explicitly considers factors in design analysis that go beyond the technology boundaries of a system to reveal important constraints for proper consideration in the process of synthesizing a design concept. The report illustrates initial benefits of this form of system analysis.
DTIC
Data Bases; Mental Performance; Systems Analysis; Systems Engineering

19990026041 General Accounting Office, National Security and International Affairs Div., Washington, DC USA
Unmanned Aerial Vehicles: Progress Toward Meeting High Altitude Endurance Aircraft Price Goals
Dec. 1998; 11p; In English; Report to Congressional Committees.
Report No.(s): AD-A358637; GAO/NSIAD-99-29; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Section 216 of the National Defense Authorization Act for Fiscal Year 1998 directed us to review the Department of Defense's (DOD) High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAV) program to determine whether the average flyaway cost for the Global Hawk and DarkStar HAE air vehicles will be within DOD's cost goal of $10 million As agreed with your office, this report addresses the status of DOD'S progress toward meeting its goal as the HAE program proceeds through its ongoing demonstration phase. DOD does not expect to be able to produce DarkStar or Global Hawk HAE vehicles within its goal of $10 million per unit in fiscal year 1994 dollars. DOD'S price projections, which updated the original estimates of $10 million, are currently $13.7 million for DarkStar and $14.8 million for Global Hawk, In addition, these projections may understate the actual amount by which the UAV'S unit price will exceed $10 million because in their agreements with the HAE contractors, program officials used a defamation of unit flyaway price that excludes several cost categories that are traditionally included in determining unit flyaway cost. Including these costs will increase the average unit price of each air vehicle. United States General Accounting Office Washington, D.C. 20548 National Security and International Affairs Division B-280126 December 15, 1998 Congressional Committees Section 216 of the National Defense Authorization Act for Hiscal Yea: 1998 directed us to review the Department of Defense's (DOD) High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAv) program to determine whether the average flyaway cost for the Global Hawk and DarkStar HAE alr vehides will be within DOD's cost goal of $10 million.1 As agreed with your office, this report addresses the status of DOD'S progress toward meeting its goal as the HAE program proceeds through its ongoing demonstration phase.
DTIC
Defense Program; Estimates; High Altitude; Pilotless Aircraft; Reconnaissance Aircraft

19990026115 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Service History of the F-111 Wing Pivot Fitting Upper Surface Boron/Epoxy Doublers
Chalkley, Peter, Defence Science and Technology Organisation, Australia; Geddes, Rowan, Defence Science and Technology Organisation, Australia; Sep. 1998; 15p; In English; Original contains color illustrations
Report No.(s): DSTO-TN-0168; DODA-AR-010-643; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

Several of the boron/epoxy doublers applied to upper surface of RAAF F-111C wing-pivot-fittings (WPFS) have disbonded. Based on RAAF records, a total of seven wings (out of forty to which doublers have been applied) have confirmed disbonds: A15-3, A15-5, A15-10, A15-14, A15-19, A15-20 and A15-284R. Most of the disbonds are forming in the smaller forward doubler (five confirmed) although three aft doublers have also disbonded. This report documents the service history of all doublers applied to RAAF F-111Cs. The current investigation suggests that disbonds in the boron/epoxy doublers on the upper surface of F-111 WPFs are forming within 1000 AFHRS service. However, infrequent inspections of the doublers make a precise determination difficult. Issues such as the use of external wing tanks on some aircraft (especially RF111Cs), disbond initiation sites and below tolerance wing skin thicknesses are investigated.
Author
F-111 Aircraft; Wings; Pivots; Inspection; Defects; Debonding (Materials); Boron-Epoxy Composites

19990026259 Instituto Nacional de Tecnica Aeroespacial, Torrejon de Ardoz, Spain
Application of the Theory of Control on Aerodynamic Design: Theoretical Development *Aplicacion de la teoria de Control al diseno aerodinamico. Desarrollo teorica.*
Jun. 16, 1997; 26p; In Spanish
Report No.(s): AT/TNO/4510/INTA/97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper is a study on the application of control to aerodynamic design. The problem of the optimization of certain profiles such as to extend the geometry (wing design), fluid models, and aerodynamic coefficients were solved by the examination of vari-

ous linear equations. Euler's two- and three-dimensional problems, and the finite difference theory were used consistently throughout this paper. In this numerical optimization a significant amount of time was dedicated to the pressure distribution because of its significance to the ultimate design of the models.
CASI
Optimal Control; Aircraft Design; Incompressible Flow; Computational Fluid Dynamics; Euler Equations of Motion; Finite Difference Theory

19990026323 British Aerospace Airbus Ltd., Bristol, UK
The Effect of Corrosion on the Structural Integrity of Commercial Aircraft Structure
Worsfold, Martin, British Aerospace Airbus Ltd., UK; Fatigue in the Presence of Corrosion; March 1999; 10p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The purpose of this paper is to discuss the effect of corrosion on the structural integrity of commercial aircraft wing structure. Data is presented for fatigue specimens tested with corrosion damage and following a spotface repair operation. The data demonstrates that failure initiates earlier from specimens with corrosion damage, when compared to corrosion free specimens, and that the reduction in fatigue life was due to a shortened crack initiation period.
Author
Corrosion; Structural Failure; Aircraft Maintenance; Wings; Fatigue Life; Commercial Aircraft; Crack Initiation; Aircraft Reliability

19990026324 Divisione Aerea Studi Ricerche e Sperimentazioni, Chemical-Technological Dept., Pratica di Mare, Italy
Aging Aircraft: In Service Experience on MB-326
Colavita, Mario, Divisione Aerea Studi Ricerche e Sperimentazioni, Italy; Dati, Enrico, Divisione Aerea Studi Ricerche e Sperimentazioni, Italy; Trivisonno, Giovanni, Divisione Aerea Studi Ricerche e Sperimentazioni, Italy; Fatigue in the Presence of Corrosion; March 1999; 6p; In English; See also 19990026320; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

In 1996 a European research project on Structure Maintenance of Aging Aircraft (SMAAC), where a consistent number of partners decided to cooperate in order to offer an answer to this problem was begun. The first purpose of the research project was joining the In-Service Experiences that allow to relate all structural and chemical degradation induced by corrosion to the potential interactions with fatigue. Italian Air Force (IAF) and AerMacchi decided to carry out a tear-down inspection on a 30 year old Macchi MB-326, a small trainer aircraft, having 4685 flight hours with respect to 5979 safe life hours. For this purpose the chosen test articles were fuselage center section, tailplane, wings, and front fuselage. The first two of them were investigated at the Air Force laboratories and the other ones at the AerMacchi research department. Particular attention was focused on the components subjected to the high stress and potential corrosion in areas not accessible during routine servicing.
Author
Fatigue (Materials); Corrosion; Structural Failure; Aircraft Reliability; Aircraft Maintenance; Aircraft Structures; Stress Corrosion; Inspection; Service Life

19990026326 Patras Univ., Lab. of Technology and Strength of Materials, Greece
The Effect of Existing Corrosion on the Structural Integrity of Aging Aircraft
Pantelakis, S. G., Patras Univ., Greece; Kermanidis, T. B., Patras Univ., Greece; Daglaras, P. G., Patras Univ., Greece; Apostolopoulos, C. A., Patras Univ., Greece; Fatigue in the Presence of Corrosion; March 1999; 14p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Investigation on effects of existing corrosion on the structural integrity of aging aircraft structures was made. The study included characterization of the tensile behaviour as well as determination of the fatigue and fatigue crack growth behaviour of structural aircraft aluminium alloys following corrosion exposure. The investigation of the tensile behaviour following corrosion exposure was performed on the aluminium alloys 2024, 8090, 2091, and 6013. The materials were exposed to five different accelerated laboratory corrosion tests; alloy 2024 T351 was also subjected to out-door exposure. Evaluation has shown an appreciable decrease of yield and ultimate tensile stress caused by corrosion attack on the materials surface layers. In addition, a dramatic volumetric embrittlement of the corroded materials was observed; it has been associated to hydrogen penetration and absorption. The influence of existing corrosion on fatigue life and fatigue crack growth of 2024 alloy was evaluated as well. Obtained S-N curves are confirming the expected decrease of fatigue life following corrosion. Fatigue crack growth tests performed for several

R-ratios have shown that crack growth rates are practically not practically influenced by existing corrosion, yet, this result should not be misinterpreted as an insignificance of existing corrosion for the damage tolerance behaviour of the structure.
Author
Corrosion; Structural Failure; Aircraft Structures; Aluminum Alloys; Corrosion Tests; Crack Propagation; Hydrogen Embrittlement; Fatigue Life; Tensile Stress

19990026333 Air Force Research Lab., Robins AFB, GA USA
Corrosion in USAF Aging Aircraft Fleets
Kinzie, Richard, Air Force Research Lab., USA; Cooke, Garth, Air Force Research Lab., USA; Fatigue in the Presence of Corrosion; March 1999; 12p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper summarizes the results of research projects undertaken by the USA Air Force Corrosion Program Office within the past year and a half. It reflects the cooperative results obtained from a team of almost 50 researchers that represented over a dozen different corporate entities. All were marching to a tune composed and conducted by the program office. This paper covers work associated with environmental modeling, development of a revised corrosion maintenance concept, and development of a corrosion growth model that can be used by depot engineers to improve the maintenance of their aircraft.
Author
Fatigue (Materials); Military Aircraft; Corrosion; Structural Failure; Aircraft Reliability; Aircraft Maintenance

19990026338 Analytical Processes/Engineered Solutions, Inc., Saint Louis, MO USA
Integrating Real Time Age Degradation Into the Structural Integrity Process
Brooks, Craig L., Analytical Processes/Engineered Solutions, Inc., USA; Simpson, David, Institute for Aerospace Research, Canada; Fatigue in the Presence of Corrosion; March 1999; 13p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The principal focus of this paper is to describe a process for incorporating the "age degradation" aspects of aircraft into the existing infrastructure of the design, manufacturing, and maintenance of aircraft systems. The tailoring of the structural integrity process enables the industry and the user communities to meet the needs, opportunities, and challenges being presented by the Aging Aircraft Fleet. The economic and safety impact of the continued use of some aircraft necessitates an enhancement to the existing system. This paper describes the rationale, approaches, and techniques to evolve the structural integrity process to include the effects of corrosion, sustained stress corrosion cracking, and other age related degradation effects. A viable method of utilizing the proposed approach is presented in a fashion to realize benefits throughout the full life cycle of aircraft systems.
Author
Fatigue (Materials); Corrosion; Structural Failure; Aircraft Maintenance; Aging (Metallurgy); Degradation; Real Time Operation; Stress Corrosion Cracking; Manufacturing

19990026392 Department of Energy, Washington, DC USA
Experimental flight test vibration measurements and nondestructive inspection on a USCG HC-130H aircraft
Moore, D. G., Department of Energy, USA; Jones, C. R., Department of Energy, USA; Mihelic, J. E., Department of Energy, USA; Barnes, J. D., Department of Energy, USA; Dec. 31, 1998; 10p; In English; 2nd; Aging aircraft; Sponsored by NASA, USA
Report No.(s): DE98-006173; SAND-98-0248C; CONF-980830; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper presents results of experimental flight test vibration measurements and structural inspections performed by the Federal Aviation Administration's Airworthiness Assurance NDI Validation Center (AANC) at Sandia National Laboratories and the US Coast Guard Aircraft Repair and Supply Center (ARSC). Structural and aerodynamic changes induced by mounting a Forward Looking Infrared (FLIR) system on a USCG HC-130H aircraft are described. The FLIR adversely affected the air flow characteristics and structural vibration on the external skin of the aircraft's right main wheel well fairing. Upon initial discovery of skin cracking and visual observation of skin vibration in flight by the FLIR, a baseline flight without the FLIR was conducted and compared to other measurements with the FLIR installed. Nondestructive inspection procedures were developed to detect cracks in the skin and supporting structural elements and document the initial structural condition of the aircraft. Inspection results and flight test vibration data revealed that the FLIR created higher than expected flight loading and was the possible source of the skin cracking. The Coast Guard performed significant structural repair and enhancement on this aircraft, and additional in-flight vibration measurements were collected on the strengthened area both with and without the FLIR installed. After three months of further operational FLIR usage, the new aircraft skin with the enhanced structural modification was reinspected and found to be free of flaws. Additional US Coast Guard HC-130H aircraft are now being similarly modified to accommodate this FLIR system. Measurements of in- flight vibration levels with and without the FLIR installed, and both before and after the structural enhancement

and repair were conducted on the skin and supporting structure in the aircraft's right main wheel fairing. Inspection results and techniques developed to verify the aircraft's structural integrity are discussed.
NTIS
Flight Tests; Vibration Measurement; Aircraft Maintenance; Inspection; Nondestructive Tests

19990026436 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Velocity Field Over Delta Wings at High Angles of Attack
O'Dowd, Devin O.; Feb. 08, 1999; 69p; In English
Report No.(s): AD-A359980; AFIT-FY99-81; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The study of vortex breakdown over delta wings at high angles of attack (AOA) has been an interest to researchers, mathematicians, and aircraft designers for decades. It is a very hot topic as it relates to many aircraft being designed today and because no complete understanding exists. Most of the understanding that does exist comes in the form of the problems associated with vortex breakdown. Many question if it is possible to control the breakdown to avoid the problems and to aid the aircraft in maneuverability. The purpose of this study is to lay the foundation for future research at the University of Washington, so that the identity to the cause of the vortex breakdown may be found.
DTIC
Vortex Breakdown; Aircraft Maneuvers; Delta Wings

19990026503 Tennessee Univ., Knoxville, TN USA
The Development of a Verification and Validation (V and V) Plan for a Proposed Tactical Engagement Simulation System for the AH-64D Attack Helicopter
Papalaikis, Robert A.; Nov. 1998; 177p; In English
Report No.(s): AD-A359363; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Advances in weapon systems technology creates the potential for increased warfighting capability. These advances simultaneously create the need for effective simulation systems of these contemporary technologies. The credibility and capability of these weapons systems Models and Simulation (M&S) are evaluated by a Verification and Validation (V&V) process, typically performed during the system development and subsequent Developmental Testing (DT). The tactical effectiveness and suitability of the integrated system are then evaluated through Operational Testing (OT). Historically, the tasks associated with DT and OT are performed by separate organizations in isolation. This thesis proposes a methodology for the Verification and Validation of the weapons systems models implicit in the AH-64D Longbow Apache Tactical Engagement Simulation (TES) System. In addition, this thesis develops a V&V plan to evaluate the simulation provided by the integrated Longbow TES system. The design of this plan provides for the simultaneous collection of OT data to support system suitability evaluation. This will reduce future OT requirements, thus decreasing the time required for the acquisition cycle. This proposition of performing the TES V&V as a combination of DT (V&V) and OT supports the rapid prototyping philosophy which is useful in proving the concepts of new technology and complex systems.
DTIC
Computerized Simulation; Helicopters; Weapon Systems; Systems Simulation; Systems Engineering; Data Acquisition

19990026605 NASA Dryden Flight Research Center, Edwards,CA USA
A Base Drag Reduction Experiment on the X-33 Linear Aerospike SR-71 Experiment (LASRE) Flight Program
Whitmore, Stephen A., NASA Dryden Flight Research Center, USA; Moes, Timothy R., NASA Dryden Flight Research Center, USA; Mar. 1999; 21p; In English; 37th; Aerospace Sciences, 11-14 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contracts/Grants(s): RTOP 242-33-02
Report No.(s): NASA/TM-1999-206575; H-2333; NAS 1.15:206575; AIAA Paper 99-0277; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Drag reduction tests were conducted on the LASRE/X-33 flight experiment. The LASRE experiment is a flight test of a roughly 20% scale model of an X-33 forebody with a single aerospike engine at the rear. The experiment apparatus is mounted on top of an SR-71 aircraft. This paper suggests a method for reducing base drag by adding surface roughness along the forebody. Calculations show a potential for base drag reductions of 8-14%. Flight results corroborate the base drag reduction, with actual reductions of 15% in the high-subsonic flight regime. An unexpected result of this experiment is that drag benefits were shown to persist well into the supersonic flight regime. Flight results show no overall net drag reduction. Applied surface roughness causes forebody pressures to rise and offset base drag reductions. Apparently the grit displaced streamlines outward, causing fore-

body compression. Results of the LASRE drag experiments are inconclusive and more work is needed. Clearly, however, the forebody grit application works as a viable drag reduction tool.
Author
Aerodynamic Drag; Drag Reduction; Flight Tests; Drag Measurement

19990026607 National Aerospace Lab., Amsterdam Netherlands
Design Optimization of Stiffened Composite Panels With Buckling and Damage Tolerance Constraints; Presented at the AIAA-SDM Conference (39th) Held at Long Beach, California on April 20-23 1998
Wiggenraad, J. F.; Arendsen, P.; da Silva Pereira, J. M.; Jan. 1998; 15p; In English
Report No.(s): AD-A359832; NLR-TP-98024; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The design of stiffened, composite wing panels must satisfy a range of requirements related to performance, economy and safety. In particular, the design must be damage tolerant to satisfy a number of different performance requirements for various states of damage. to obtain an optimum configuration that satisfies these requirements simultaneously, optimization code PANOPT was extended with a multi-model capability. First, the effect of damage tolerance constraints on postbuckled optimum design was established for blade- I- and hat-stiffened panels with stiffener flanges embedded in the skin. The classical" order of efficiency for optimized panels designed for buckling alone (hats, I's, blades) was no longer valid, as the masses of the three panel types were approximately equal. to obtain realistic damage models, the failure mechanisms and damage tolerance of the panel concept with embedded stiffeners were determined in an experimental programme. Finally, the multi-model capability PANOPT was demonstrated with the simultaneous optimization of undamaged panel carrying design ultimate load, the same panel with a separated stiffener carrying design limit load, and the panel with a cut stiffener carrying seventy percent of the design limit load. An optimum design was found with an additional mass of only five percent compared to a panel optimized for the undamaged case alone.
DTIC
Composite Structures; Degradation; Buckling; Airframes; Panels; Fault Tolerance; Structural Design

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices, and flight instruments.

19990025942 Illinois Univ., Urbana, IL USA
Frames of Reference for Electronic Map Displays: Their Effect on Local Guidance and Global Situation Awareness During Low Altitude Rotorcraft Operations
Poole, Patrick E.; Jan. 07, 1999; 92p; In English
Report No.(s): AD-A359797; AFIT-FY99-29; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This study sought to examine frame of reference for electronic map displays and determine its effect on pilot local guidance ability and global situation awareness (GSA) during low altitude rotorcraft flights. It was hypothesized that the egocentric viewpoint would support superior local guidance ability, the egocentric viewpoint would facilitate better GSA, and the Situation Awareness Rating Technique (SART) would not be a good measure of GSA. Eighteen pilots flew simulated missions on six possible paths, with three paths flown at 200 feet and three paths flown at 1,000 feet. All participants flew both a low altitude and a high altitude scenario with each of three display viewpoints (egocentric, exocentric, 2D), for a total of six missions. Results revealed that the forward field of view present in the simulation appears to mute the effect of display type on local guidance ability such that all three of the viewpoints evaluated provided equivalent navigation performance. The results for the level of GSA achieved revealed that the egocentric viewpoint suffered with regards to facilitating GSA, but no differences were revealed between the exocentric and 2D viewpoints. Furthermore, the GSA results suggested that the SART may not be a good measure of global situation awareness. Results are discussed in terms of map display design for rotorcraft cockpits.
DTIC
Display Devices; Maps; Electronic Equipment; Rotary Wing Aircraft

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19990025262 Naval Postgraduate School, Monterey, CA USA
Logistics Simulations Metamodel for F404-GE-400 Engine Maintenance
Stearns III, Dick E.; Dec. 1998; 70p; In English
Report No.(s): AD-A359328; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This thesis presents a simulation metamodel that is used to determine initial rotable pool inventories for F404-GE-400 engine modules onboard a deployed aircraft carrier. Millions of dollars can be saved annually by following the metamodel recommendations for changes and reductions in inventories, while at the same time maximizing F/A-18 squadron operational availability. Managers and leaders in the naval aviation and supply communities should use the metamodel as a tool to modify F404 engine module inventory allowance requirements. The metamodel is valid and provides a real means to address the problem of optimizing module inventory levels with operational availability that before would have been overwhelming and impossible to tackle fully. With the power of today's personal computers, combined with sophisticated simulation programs, simulating the F404 engine module repair process at the afloat Aviation Intermediate Maintenance Depot (AIMD) level is accomplishable. The simulation model is developed from real maintenance and usage data and provides a detailed and accurate representation of the repair process. The results of this thesis can be generalized and applied to a wide family of weapon systems. As military leaders struggle more and more with balancing readiness and limited funds, the metamodel presented in this thesis offers a visible decision-support tool.
DTIC
Aircraft Maintenance; Logistics; Computerized Simulation; Modules

19990025544 Naval Postgraduate School, Monterey, CA USA
Evaluation of a Liquid-Fueled Pulse Detonation Engine Combustor
Forster, David L.; Dec. 1998; 73p; In English
Contract(s)/Grant(s): N00014-98-W-R200
Report No.(s): AD-A359179; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An evaluation of five liquid-fueled pulse detonation engine combustor geometries and flow field conditions was performed over a wide range of equivalence ratios. Particle sizing and spray characterization of commercially available atomizers was conducted to determine the optimum conditions that produced acceptable mass flow and particle size distribution for use in the combustor. The chosen atomizer was installed in the combustor geometries and then analyzed over a range of combustor conditions to measure deflagration to detonation transition (DDT) distances and detonation wave velocities for each condition. Testing was conducted for ambient (100-110 deg F) and higher wall temperatures (greater than 300 deg F) at an operating frequency of 5Hz. It was found that the shortest DDT for JP10 and O2 was achieved using a stepped front-end insert under hot conditions and with a loaded equivalence ratio greater than .75, but less than 1.15.
DTIC
Ramjet Engines; High Temperature Environments; Detonation Waves; Flow Distribution; Combustion Chambers; Atomizers

19990025583 History Enterprises, Inc., Cleveland, OH USA
The Advanced Turboprop Project: Radical Innovation in a Conservative Environment, Chapter 14
Bowles, Mark D., History Enterprises, Inc., USA; Dawson, Virginia P., History Enterprises, Inc., USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 321-343; In English; ISBN 0-16-049864-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Not since 1958, had NASA won a Collier Award for innovations in aeronautics. With the development of the Advanced Turboprop engine, this was no longer true. In 1987, the team responsible for the development of the Advanced Turboprop engine was recognized for its achievements. This program was initiated in an attempt to achieve fast, and cost effective air flight in light of the energy crisis of the 1970's and 80's. With the use of super computers and computer-generated design codes the program progressed to investigate propeller aerodynamics, to attempt to reduce the noise generated from propellers. Two problems surfaced for the program: (1) the public perception that development of advanced turbo prop engine was not a step forward, and (2) the eventual relative decrease in fuel prices lessened the requirement.
CASI
Computer Aided Design; Noise Reduction; Propeller Noise; Rotor Aerodynamics; Turboprop Engines; Awards; NASA Programs

19990025649 Air Force Research Lab., Propulsion Directorate, Wright-Patterson AFB, OH USA
High Cycle Fatigue (HCF) Science and Technology Program *Annual Report, 1 Jan. - 31 Dec. 1998*
Jan. 1999; 131p; In English
Contract(s)/Grant(s): F33615-98-C-2807; AF Proj. APPL
Report No.(s): AD-A359294; AFRL-PR-WP-TM-1998-2148; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This second annual report of the National Turbine Engine High Cycle Fatigue (HCF) Program is a brief review of work completed, work in progress, and technical accomplishments. This program is a coordinated effort with participation by the Air Force, the NavAir Force, the Navy, and NASA. The technical efforts are organized under seven Action Teams including: Materials Damage Tolerance Research, Forced Response Prediction, Component Analysis, Instrumentation, Passive Damping Technology, Component Surface Treatments, and Aeromechanical Characterization. Daniel E. Thomson, AFRL/PRTC, Wright-Patterson AFB, is the Program Manager.

DTIC

Research and Development; Surface Treatment; Technologies; Tolerances (Mechanics)

08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19990025985 NASA Langley Research Center, Hampton, VA USA
A Control Law Design Method Facilitating Control Power, Robustness, Agility, and Flying Qualities Tradeoffs: CRAFT
Murphy, Patrick C., NASA Langley Research Center, USA; Davidson, John B., NASA Langley Research Center, USA; Sep. 1998; 44p; In English
Contract(s)/Grant(s): RTOP 505-68-30-05
Report No.(s): NASA/TP-1998-208463; L-17571; NAS 1.60:208463; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A multi-input, multi-output control law design methodology, named "CRAFT", is presented. CRAFT stands for the design objectives addressed, namely, Control power, Robustness, Agility, and Flying Qualities Tradeoffs. The methodology makes use of control law design metrics from each of the four design objective areas. It combines eigenspace assignment, which allows for direct specification of eigenvalues and eigenvectors, with a graphical approach for representing the metrics that captures numerous design goals in one composite illustration. Sensitivity of the metrics to eigenspace choice is clearly displayed, enabling the designer to assess the cost of design tradeoffs. This approach enhances the designer's ability to make informed design tradeoffs and to reach effective final designs. An example of the CRAFT methodology applied to an advanced experimental fighter and discussion of associated design issues are provided.

Author

Control Theory; Eigenvalues; Eigenvectors; Flight Control; Thrust Vector Control; Fighter Aircraft; Aerodynamic Characteristics

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports; hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

19990025633 Jefferson (Thomas) National Accelerator Facility, Newport News, VA USA
The Transonic Wind Tunnel and the NACA Technical Culture, Chapter 4
Corneliussen, Steven T., Jefferson (Thomas) National Accelerator Facility, USA; From Engineering Science to Big Science: The NACA and NASA Collier Trophy Research Project Winners; 1998, pp. 91-133; In English; ISBN 0-16-049640-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

When the USA began expanding a national effort in applied aeronautical research during the 1920's a new research tool was required. In 1951, the Collier Trophy was awarded to the engineers and aeronautical researchers of the National Advisory Committee for Aeronautics for the new transonic wind tunnels. This award was an important recognition of the importance of research

tools in aeronautics. Until then the award had gone, almost exclusively, to advances in aeronautics such as aircraft, air operations, heroic flights and new airplanes, rather than the research tools which had made the other advances possible.
CASI
Transonic Wind Tunnels; Wind Tunnel Walls; Slotted Wind Tunnels; Scale Effect

19990025653 Science Applications International Corp., Arlington, VA USA
Heliport Lighting: Technology Research *Final Report*
Kimberlin, Ralph D.; Sims, J. P.; Bailey, Thomas E.; Nov. 1998; 45p; In English; Prepared in cooperation with Univ. of Tennessee Space Institute, Tullahoma, TN 37388.
Contract(s)/Grant(s): DTFA01-93-C-00030
Report No.(s): AD-A359316; DOT/FAA/ND-98/1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document reports on the initial phase of a program to develop a cost-effective heliport lighting system for Global Positioning System (GPS) helicopter approaches. The investigation into lighting technologies shows that many of the currently available technologies would be effective. These include: electroluminescent panels, light pipes or bars, strobes, cold cathode strobes, identification beacons and point light sources. Results showed that future experiments with helicopter GPS approach lighting arrays should refine the geometric pattern of the light sources, the spacing of the light sources, the direction of the light line, the intensity of the light source, the color of the light source, the pulse duration for any strobing lights, and the potential use of special types of lights and filters. Additionally, the light sources should contrast with background lights. Line-up and glideslope lights should provide a sufficient visual angle disparity to cue off-course conditions and the required correction.
DTIC
Global Positioning System; Pulse Duration; Point Sources; Luminous Intensity; Light Sources; Illuminating; Heliports; Helicopters

19990025660 NYMA, Inc., Brook Park, OH USA
Flow Field Surveys of the NASA Lewis Research Center 8- by-6-Foot Supersonic Wind Tunnel (1993 Test) *Final Report*
Arrington, E. Allen, NYMA, Inc., USA; December 1998; 37p; In English
Contract(s)/Grant(s): NAS3-27186; RTOP 523-91-13
Report No.(s): NASA/CR-1998-206610; E-11146; NAS 1.26:206610; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An abbreviated program was conducted in the NASA Lewis Research Center 8- by 6-Foot Supersonic Wind Tunnel to calibrate the test section and survey the flow quality following the installation of flow quality improvements in the facility. This program was designed to accommodate the specific requirements of an aeropropulsion research test program that took place before a complete test section calibration was conducted. Therefore, the flow quality goals for the 8- by 6-ft test section were based on the specific requirements of the research program and the facility's operational constraints. Test results indicate that flow quality in the test section was good and met or exceeded the agreed-upon goals at all except the Mach 2 setting.
Author
Wind Tunnel Tests; Supersonic Wind Tunnels; Supersonic Speed; Flow Distribution; Shock Tunnels; Superharmonics

19990025756 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA
Airport Improvement Program: FAA Complying with Requirements for Local Involvement in Noise Mitigation Projects
Dec. 1998; 11p; In English; Report to the Honorable Adam Smith, House of Representatives.
Report No.(s): AD-A359053; GAO/RCED-99-41; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Airports are responsible for controlling the impacts of aircraft noise by mitigating its effects in the immediate vicinity. Through the Airport Improvement Program (AIP), the Federal Aviation Administration (FAA) provides grants for such mitigation efforts. As a condition of receiving AIP grants, airport owners sign a series of assurances that the funds will be spent according to pertinent laws, regulations, or administrative policies. Under FAA policy, one of these grant assurances calls for an airport owner to obtain from each city, county, municipality, or other agency that has control or authority over property affected by the grant a written declaration stating that the project is reasonably consistent with local plans and has local support. Complying with this policy has been an issue at the Seattle-Tacoma International Airport, where some local groups opposed to the airport's expansion have criticized the airport's noise mitigation program and have pointed out that FAA did not require the airport to obtain written declarations that the project was consistent with local plans and had local support. Concerned about the level of consultation that occurs between affected communities and the airport, you asked us to determine whether FAA must enforce this grant assur-

ance as a condition of providing noise mitigation grants to the Seattle-Tacoma International Airport, which is operated by the Port of Seattle.
DTIC
Aircraft Noise; Airports; Cities

19980025915 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Airport Surveillance Radar Model 11 (ASR-11) FAA Test and Evaluation Master Plan (TEMP)
Weber, Ronald; Schanne, Joseph; Feb. 1998; 92p; In English
Report No.(s): AD-A359390; DOT/FAA/CT-TN97/27; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Airport Surveillance Radar, Model 11 (ASR-11) is a joint Federal Aviation Administration (FAA)/Department of Defense (DoD) procurement program with the USA Air Force (USAF) assuming overall lead responsibility. The DoD has designated their program as the Digital Airport Surveillance Radar (DASR). A joint FAA/DoD Test and Evaluation (T&E) program will be conducted in order to support a joint production decision. A Memorandum of Agreement (MOA) between the two agencies defines overall roles and responsibilities for each agency in accomplishing this effort. This ASR-11 Test and Evaluation Master Plan (TEMP) provides an overview of the joint FAA/DoD test program. It outlines the approach and philosophy to be implemented by the FAA to ensure that all FAA test requirements are met. It assigns responsibilities for each T&E phase, defines requirements for test readiness and acceptance, and identifies how each critical issue and major systems requirement will be tested. The FAA test program outlined in this TEMP will be accomplished in accordance with the Acquisition Management System (AMS) T&E Process Guidelines.
DTIC
Digital Radar Systems; Management Systems; Surveillance Radar; Radar Equipment

19980026609 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
The Interim Runway Visual Range/Automated Surface Observing System Interface Instruction and Operational User Guide
Benner, William; McKinney, Michael; Jones, Michael; Mar. 1998; 42p; In English; Prepared in collaboration with Raytheon Service Co., Burlington, MA.
Report No.(s): AD-A359839; DOT/FAA/CT-TN98/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Interim Runway Visual Range/Automated Surface Observing System Interface (Interim RVR/ASOS Interface) Instruction and Operational User Guide is intended to inform users of Interim RVR/ASOS Interface performance features. It is designed to allow users to become familiar with proper use of the interface to facilitate data transfer from the New Generation RVR System to the ASOS at required locations. Successful operation of the interface will enable automated Long-Line RVR service from equipped ASOSs. After reading this guide, users should be able to properly install, configure, start, and stop operation of the interface as well as trouble-shoot most problems that may occur during use. The guide is typically packaged as part of a kit containing equipment and accessories for unaided installation by airport technicians. As of January 31, 1998, operation of the interface exists at seven international airports including: Los Angeles, CA; Denver, CO; Chicago, IL; Portland, OR; Nashville, TN; Seattle, WA; and San Francisco, CA. Federal Aviation Administration (FAA) plans include installation and operation of the interface at approximately 110 airports throughout the U.S. Current system requirements for installation of the interface are: (1) New Generation RVR National Deployment Baseline version software; and (2) ASOS software version 2.49.
DTIC
Runways; Airports; Navigation Aids

19980026610 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Interim Runway Visual Range (RVR) Automated Surface Observing System (ASOS) Interface Regression Operational Test and Evaluation (OT and E) Report
Benner, William; McKinney, Michael; Jones, Michael; Aug. 1998; 50p; In English; Prepared in collaboration with Raytheon Service Co., Burlington, MA.
Report No.(s): AD-A359840; DOT/FAA/CT-TN98/14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report details results of a regression test performed on the Interim Runway Visual Range (RVR)/Automated Surface Observing System (ASOS) Interface. Testing was conducted from January 21 through 23, 1997, at Memphis International Airport (MEM). Testing was intended to determine if modifications to the interface corrected problems observed during initial testing October of 1996. Testing also was designed to determine if Interim RVR/ASOS software performance enhancements operated in accordance with user needs and functions. Problems observed during the initial test included the following: (1) ASOS Display Screen Mismatch with RVR product, (2) Interim RVR/ASOS Interface Boot Failure, (3) Interim RVR/ASOS Software Lock-Up,

(4) New Generation RVR Output Rate and Interim RVR/ASOS Interface Software synchronization, (5) Phantom RVR products with RVR Configuration Modifications, and (6) False RVR products during RVR Sensor Calibration. of the problems discovered during initial testing, nine were resolved as a result of modifications to the Interim RVR/ASOS Interface and the ASOS. It was determined that a maintenance procedure could be used to correct the remaining problem. Correction and resolution of the problems identified during initial Operational Test and Evaluation (OT&E) indicate the Interim RVR/ASOS Interface and ASOS RVR functions are suitable for use in the field from an operational perspective. Proper performance demonstrated by the Interim RVR/ASOS Interface self-restart and illegal entry prevention features also indicate the Interim RVR/ASOS Interface can be used with a minimum of maintenance actions by field technicians. These developments suggest the Interim RVR/ASOS Interface is prepared for use at designated Long-Line RVR sites. As a result, ACT-320 recommends deployment of the interface at sites designated by the National Weather Service (NWS) and Federal Aviation Administration (FAA).
DTIC
Runways; Navigation Aids; Airports; Software Engineering

19990026611 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA
Interim Runway Visual Range (RVR) Automated Surface Observing System (ASOS) Interface Operational Test and Evaluation (OT&E) Regression Test Number 2 Report
Benner, William; McKinney, Michael; Jones, Michael; Aug. 1998; 34p; In English; Prepared in collaboration with Raytheon Service Co., Burlington, MA.
Report No.(s): AD-A359841; DOT/FAA/CT-TN98/7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report discusses results of a regression test performed on the Interim Runway Visual Range (RVR)/Automated Surface Observing System (ASOS) Interface. Testing was conducted from September 29, 1997, to October 13,1997, at Memphis International Airport. This was the second regression test performed on the interface following modifications to the RVR-ASOS executable, which operates on the Hewlett Packard Palmtop Personal Computer (HP Palmtop PC). Regression Test #2 was primarily intended to determine if the HP Palmtop RVR-ASOS executable would accurately calculate Long-Line RVR data during various configurations and combinations of New Generation RVR data. Proper ingestion and Display of Long-Line RVR products were also confirmed on ASOS display screens. Test results indicate the custom HP Palmtop software accurately calculated Long-Line RVR readings during the conducted test scenarios. Proper ingestion and display of Long-Line RVR data were confirmed on the ASOS. Results also indicate several problems found during previous OT&E tests were corrected from software modifications to the HP Palmtop and the ASOS. These results suggest the Interim RVR/ASOS Interface is suitable for field deployment and usage. Despite the performance improvements observed, four problems were documented during testing. Three problems related to operation of the ASOS and one concerned operation of the HP Palmtop. Since it is anticipated the observed problems will not impact normal operation of the Interim RVR/ASOS Interface or ASOS, ACT-320 recommends deployment at locations designated by the Federal Aviation Administration (FAA) and the National Weather Service (NWS).
DTIC
Airports; Runways; Navigation Aids; Software Engineering

10
ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

19990025657 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Use of Laser Altimetry in the Orbit and Attitude Determination of Mars Global Surveyor
Rowlands, D. D., NASA Goddard Space Flight Center, USA; Pavlis, D. E., Raytheon STX Corp., USA; Lemoine, F. G., NASA Goddard Space Flight Center, USA; Neumann, G. A., NASA Goddard Space Flight Center, USA; Luthcke, S. B., Raytheon STX Corp., USA; Geophysical Research Letters; 1999; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Altimetry from the Mars Observer Laser Altimeter (MOLA) which is carried on board Mars Global Surveyor (MGS) has been analyzed for the period of the MOS mission known as Science Phasing Orbit 1 (SPO-1). We have used these altimeter ranges to improve orbit and attitude knowledge for MGS. This has been accomplished by writing crossover constraint equations that have

been derived from short passes of MOLA data. These constraint equations differ from traditional Crossover constraints and exploit the small foot print associated with laser altimetry.
Author
Laser Altimeters; Altimeters; Altimetry; Mars Observer; Orbit Calculation

19990026575 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Stability Analysis of Three-Dimensional Hypersonic Entry-Like Trajectories
deOliceFerreira, Leonardo, Instituto Nacional de Pesquisas Espacias, Brazil; deAlmeidaPrado, Antonio Fernando Bertachini, Instituto Nacional de Pesquisas Espacias, Brazil; Vinh, N. X., Michigan Univ., USA; 1998; 7p; In English; 2nd; Aerospace, 31 Aug. - 5 Sep. 1997, Moscow, Russia
Contract(s)/Grant(s): CNPq-300944/96-9
Report No.(s): INPE-6722-PRE/2744; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper is a study on the analysis of three-dimensional hypersonic entry-like trajectories. In order to understand the stability, the paper analyzes three-dimensional, non thrusting, single-pass, short-range lifting skip trajectories. The equation governing the reference trajectory were first nondimensionalized. A combination of the first-order regular perturbation theory and Lyapunov's first theorem was applied to the dimensionless equations.
CASI
Reentry Trajectories; Stability Tests; Unsteady Aerodynamics; Aerodynamic Stability; Hypersonic Vehicles; Equations of Motion; Aerospace Vehicles

11
CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19990025276 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
AASERT95/Science and Engineering Training in Combustion and Propulsion *Final Report, 1 Sep. 1995 - 31 Aug. 1998*
Glassman, I.; Jan. 11, 1999; 13p; In English
Contract(s)/Grant(s): F49620-95-1-0406; AF Proj. 3484
Report No.(s): AD-A359227; AFRL-SR-BL-TR-99-0009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

AASERT support permitted an additional graduate student to be added to AFOSR's "Fuels Combustion Research" program at Princeton. This support allowed fuel pyrolysis and combustion to be studied under both sub and supercritical conditions. This newly integrated program, with AASERT support, proved to be an enormous success. It was found that under supercritical conditions the pyrolysis rate of fuels have a pre-exponential rate A factor order of magnitudes greater than results obtained at 1 atm. The activation energies of the complete energy range tested remained the same. Further, due to the phenomenon known as "caging" for the fuels studied, cyclic hydrocarbons formed under supercritical conditions, but not at 1 atm, and these cyclic hydrocarbons led to polynuclear aromatics (PAH) that are the precursors to particulate formation.
DTIC
Combustion; Jet Engine Fuels; Activation Energy; Polycyclic Aromatic Hydrocarbons; Education; Fuel Combustion

19990025943 Naval Postgraduate School, Monterey, CA USA
Beam Shape Control Using Shape Memory Alloys
Kelly, Brian L.; Dec. 1998; 76p; In English
Report No.(s): AD-A358806; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis presents the design and experimental results of active position control of a shape memory alloy (SMA) wire and a SMA wire actuated composite beam. The wire is a single SMA Nickel Titanium wire mounted on a single wire test stand. The composite beam is aluminum honeycomb with SMA wires embedded in one of its face sheets for active shape control. The potential applications of this experimeat include thermo-distortion compensation for precision space structures, stern shape control for submarines, and flap shape control for aeronautical applications. SMA wires are chosen as actuating elements due to their high recovery stress (> 700 MPa) and its tolerance to high strain (up to 8%). SMA wires are inherently nonlinear, which poses a challenge for control design. The experimental setup consists of the single wire test stand and the composite beam with embedded SMA wires, a HP programmable power supply, a Linear Variable Differential Transformer (LVDT), an intrared laser range sensor, and a dSpace system with a Texas Instrument C-30 DSP for data acquisition and real-time control. A Position and Derivative (PD)

control with feed forward action was designed and implemented, and a control accuracy of 0.1 mm was achieved. A non-linear control was added which gives a control accuracy of 0.05 mm with a much faster response.
DTIC
Active Control; Afterbodies; Aircraft Control; Aluminum; Data Acquisition; Derivation; Distortion; Submarines; Transformers

19990026320 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France
Fatigue in the Presence of Corrosion *Fatigue sous Corrosion*
Fatigue in the Presence of Corrosion; March 1999; 214p; In English, 7-9 Oct. 1998, Corfu, Greece; See also 19990026321 through 19990026338; Original contains color illustrations
Report No.(s): RTO-MP-18; AC/323(AVT)TP/8; ISBN 92-837-1011-8; Copyright Waived; Avail: CASI; A10, Hardcopy; A03, Microfiche

The NATO fleets are aging in both real time and in accrued fatigue damage. Corrosion and fatigue, independently, are high cost maintenance items and both can affect airworthiness. There is a synergistic relationship between these two phenomena. Cost effective and airworthy approaches to design and corrosion prevention must be defined. Work in NATO countries could be accelerated by a sharing of experience. During the Workshop 22 papers were grouped in four sessions: Session 1, In-service Experience with Corrosion Fatigue; Session 2, Simulation/Test Evaluation Programs; Session 3, Fatigue Prediction Methodologies in Corrosive Environments; and Session 4, Structural Integrity - Corrosion and Fatigue Interactions.
Author
Fatigue (Materials); Corrosion; Service Life; Aircraft Maintenance; Corrosion Prevention; Aircraft Structures; Structural Failure; Nondestructive Tests

19990026327 Aerospatiale, Suresnes, France
Corrosion Fatigue of Aluminum Alloys: Testing and Prediction
Genkin, J.-M., Aerospatiale, France; Journet, B. G., Aerospatiale, France; Fatigue in the Presence of Corrosion; March 1999; 12p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Since the Aloha in-flight failure, the aging aircraft issue has prompted some renewed effort from the research community in the area of corrosion fatigue. This paper presents a methodology which deals with corrosion fatigue crack initiation in a pitting environment. The investigation is carried out on an aluminum lithium alloy. The obtained results shed a new light on the understanding of corrosion fatigue. Before corrosion fatigue cracks take over, the propagating flaw is a hybrid half pit / half corrosion fatigue crack. Both pitting and corrosion fatigue contribute to the flaw growth. A predictive model has been derived. The validation was made by comparing the predictions to experimentally measured pit depths and fatigue lives. A set of guidelines is given for the prediction of in-service corrosion fatigue. It highlights the materials parameters to be evaluated and the testing conditions to use.
Author
Metal Fatigue; Corrosion; Structural Failure; Aircraft Maintenance; Aluminum Alloys; Aircraft Structures; Pitting; Lithium Alloys; Cracks; Corrosion Tests

19990026328 La Sapienza Univ., Rome, Italy
Influence of Corrosion on Fatigue Crack Growth Propagation of Aluminium Lithium Alloys
Brotzu, A., La Sapienza Univ., Italy; Cavallini, M., La Sapienza Univ., Italy; Felli, F., La Sapienza Univ., Italy; Marchetti, M., La Sapienza Univ., Italy; Fatigue in the Presence of Corrosion; March 1999; 12p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

The fatigue crack propagation behaviour of three commercial Al-Li alloys (2091, 8090, and Weldalite(R) 049), supplied by the manufacturer in form of plate, have been studied. A great number of the test have been carried out in order to obtain a reliable set of data. The tests were conducted in air and 3.5%w NaCl aqueous solution at different frequencies (1, 2, 5 and 10 Hz). Fractographic examinations with a scanning electron microscope and a particular etching technique have been done in order to isolate the possible fatigue mechanisms.
Author
Fatigue (Materials); Corrosion; Aluminum Alloys; Corrosion Tests; Lithium Alloys; Crack Propagation; Fatigue Tests; Aircraft Structures

19990026329 Aluminum Co. of America, Alcoa Center, PA USA

Effect of Prior Corrosion on Fatigue Performance of Toughness Improved Fuselage Skin Sheet Alloy 2524-T3

Bray, G. H., Aluminum Co. of America, USA; Bucci, R. J., Aluminum Co. of America, USA; Golden, P. J., Purdue Univ., USA; Grandt, A. F., Purdue Univ., USA; Fatigue in the Presence of Corrosion; March 1999; 9p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Aviation industry demand for continuous safety improvement in the face of trends toward increasing service life of aircraft and cost control necessitates stronger prevention and control measures to avoid the likelihood of structural failures linked to multi-site damage (MSD) involving corrosion and fatigue. New materials with improved damage tolerance attributes can improve the margin of safety in the presence of MSD. An excellent example of one such material is new aluminum alloy 2524 (formerly C188). In this study, the effect of prior pitting corrosion on the S/N fatigue performance of thin (less than or = 3.17 mm) 2524-T3 and 2024-T3 bare sheet was evaluated in a two part study. First, smooth axial fatigue specimens were corroded by accelerated methods to approximate 1 yr seacoast exposure and then fatigue tested in lab air. The fatigue strength of 2524 was approximately 10% greater and the lifetime to failure 30 to 45% longer than that of 2024. Second, panels containing 24 open holes were similarly corroded and then fatigued in lab air for 100,000 cycles. The mean flaw areas following corrosion and fatigue were 18% smaller in 2524 and the corroded area alone 32% smaller. The results of this study indicate that thin, bare 2524 sheet is more resistant to MSD from pitting corrosion than thin, bare 2024 sheet. Alloy 2524 also offers improved structural damage tolerance in the presence of MSD due to its superior fatigue crack growth resistance and fracture toughness.

Author

Fatigue (Materials); Corrosion; Structural Failure; Aluminum Alloys; Crack Propagation; Metal Sheets; Pitting; Fuselages; Skin (Structural Member); Fatigue Tests

19990026330 Daimler-Benz Aerospace A.G., Fatigue and Fracture Mechanics Dept., Hamburg, Germany

The Effect of Environment: Durability and Crack Growth

Schmidt–Brandecker, B., Daimler-Benz Aerospace A.G., Germany; Schmidt, H.–J., Daimler-Benz Aerospace A.G., Germany; Fatigue in the Presence of Corrosion; March 1999; 9p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Structures of transport aircraft are to be designed for an optimum of weight, costs and performance. Amongst others this requires the investigation of the durability and the damage tolerance behavior of the structure. Both characteristics are significantly influenced by the environmental conditions. Additionally the load frequency has an effect on the crack growth behavior of aluminium structure. These aspects play a major role during the material selection for the next Airbus aircraft generation. For the fuselage of the planned Airbus Megaliner new materials are under consideration to comply with the forthcoming regulations and to reduce the production costs. This paper describes the results of crack growth and crack initiation tests of several aluminium alloys under varying environment and loading frequency.

Author

Fatigue (Materials); Corrosion; Aircraft Reliability; Aluminum Alloys; Crack Initiation; Crack Propagation; Aircraft Structures; Environmental Tests; Transport Aircraft; Loads (Forces)

19990026331 Hellenic Aerospace Industry, Advanced Materials and Processes Dept., Schimatari, Greece

Combined Effect of Hydrogen and Corrosion on High Strength Aircraft Structures Under Stressed Conditions

Marioli–Riga, Z. P., Hellenic Aerospace Industry, Greece; Karanika, A. N., Hellenic Aerospace Industry, Greece; Fatigue in the Presence of Corrosion; March 1999; 10p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The embrittlement of high strength landing gear steels is attributed to hydrogen absorption during electro-chemical corrosion protection treatments. Accidents have been reported after service of high strength landing gear components at low applied cycles of stresses and have been attributed to Hydrogen Embrittlement. For evaluation of the mechanical properties reduction of high strength structures, after retreatment during maintenance, specific sustained load creep tests are carried out. When an electrochemical plated notched specimen is strained, hydrogen is carried by mobile dislocations to the root of the notch. Transient cracks formed by dislocation interaction, are stabilized by the hydrogen and stresses which would be relieved by deformation in absence of hydrogen are relieved by cracking when the hydrogen content exceeds a critical value. However, these tests provide information of mechanical behaviour based only to Hydrogen absorption. In real cases the A/C components phases a combined effect of highly corrosive environment like seawater, hydrogen and loading. The present investigation is aimed to create realistic qualification

tests for high strength serviced aircraft components operated in a periodical fatigue and corrosive environment. A creep test program was developed and a series of notched specimen attacked variously by Hydrogen and corrosion salt spray have been subjected to different cycles of sustained load. The mechanism of failure was recorded and conclusions were extracted for establishing simulated qualification tests.

Author

Hydrogen Embrittlement; Corrosion; Structural Failure; Aircraft Structures; Environmental Tests; Stress Concentration; Metal Fatigue; Cracks; High Strength Steels; Landing Gear; Load Tests

19990026334 Office of Naval Research, Arlington, VA USA

Environmental Effects on Fatigue Crack Initiation and Growth

Vasudevan, A. K., Office of Naval Research, USA; Sadananda, K., Naval Research Lab., USA; Fatigue in the Presence of Corrosion; March 1999; 13p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This article discusses briefly the relative effects of the role of environment on the fatigue crack initiation and growth at ambient temperatures. Emphasis is given to describe the crack tip driving forces required to understand the basic physics. It is observed that the fatigue damage requires two driving force parameters (Delta-K and K(max)) over the entire range and that the relative role of each parameter depends strongly on the role of deformation slip and environment. The environmental effects fall into four categories that depend on the synergistic role of the environmental kinetics and deformation. The study points out that one needs the correct parameters to develop a life prediction model. The overall topics are focussed to the near threshold behavior and the concepts can be extended to higher growth rates.

Author

Fatigue (Materials); Corrosion; Structural Failure; Crack Initiation; Aircraft Reliability; Crack Propagation; Crack Tips; Environmental Tests

19990026336 Institute for Aerospace Research, Structures Materials and Propulsion Lab., Ottawa, Ontario Canada

An Experimental Study of Corrosion/Fatigue Interaction in the Development of Multiple Site Damage in Longitudinal Fuselage Skin Splices

Eastaugh, Graeme F., Institute for Aerospace Research, Canada; Merati, Ali A., Institute for Aerospace Research, Canada; Simpson, David L., Institute for Aerospace Research, Canada; Straznicky, Paul V., Carleton Univ., Canada; Scott, Jason P., Carleton Univ., Canada; Wakeman, R. Brett, Carleton Univ., Canada; Krizan, David V., Carleton Univ., Canada; Fatigue in the Presence of Corrosion; March 1999; 16p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

It is difficult and costly to study either the fatigue or the corrosion/fatigue behaviour of longitudinal fuselage splices using in-service aircraft or full-scale structural test articles. These studies are further complicated by variations in splice designs in different types of aircraft. Therefore, a means of performing representative experimental studies cost-effectively for different aircraft has been devised. A special uniaxial specimen developed earlier has been used to simulate the stress environment of an aircraft splice. This specimen is capable of providing representative fatigue crack initiation, growth, and link-up data for the typical multiple site damage (MSD) failure mode and for other crack scenarios. In-service corrosion has been simulated by applying an accelerated corrosion process to the interior of the splice without damaging other areas of the specimen. Combined exposure to both corrosion and fatigue has so far been simulated by pre-corroding, drying and then fatigue testing the specimen. The accelerated corrosion damage in MSD specimens has been compared with natural corrosion damage in aircraft splices and the overall experimental approach is considered to be adequately representative for an initial study of the effects of corrosion on the durability and damage tolerance characteristics of fuselage splices. The preliminary results of an exploratory test programme indicate that corrosion at levels found in some aircraft could significantly reduce the fatigue life of longitudinal fuselage splices and could cause important changes in failure modes.

Author

Corrosion; Structural Failure; Fuselages; Fatigue Life; Fatigue Tests; Failure Modes; Crack Initiation; Splicing; Aircraft Structures

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ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19990025274 Arizona State Univ., Dept. of Mechanical and Aerospace Engineering, Tempe, AZ USA
Influence of High-Amplitude Noise on Boundary-Layer Transition to Turbulence *Final Report*
Saric, William S.; Dec. 1998; 26p; In English
Contract(s)/Grant(s): F49620-96-1-0369
Report No.(s): AD-A359230; AFRL-SR-BL-TR-99-0008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work completes a series of detailed experiments of boundary layers undergoing transition to turbulence with the major effort directed toward the most important issue facing the understanding of fundamental causes of transition, i.e., the receptivity to freestream disturbances. This problem is reviewed in detail by Saric et al. (1994). The present effort concentrates on leading-edge receptivity and receptivity of two-dimensional roughness. The effects of large-amplitude freestream noise is considered with the effort directed toward determining the limits of linear receptivity. Single-frequency and broad-band sound waves are used along with 2-D roughness elements to determine how the unstable waves are initiated. New data are presented on leading edge-receptivity that clarify some difficulties with previous experimental work. Comparisons with recent DNS are excellent. Data are also presented for nonlinear receptivity of 2-D roughness elements. It is shown that there is little difference between the single-frequency excitation and white noise in that the response is still keenly triggered by the amplitude of the individual mode. Thus a single frequency at 120 dB is more dangerous than white noise at 120 dB where the energy is distributed of many modes.
DTIC
Boundary Layer Transition; Aerodynamic Noise; Boundary Layers; Free Flow; Broadband

19990025335 Civil Aeromedical Inst., Oklahoma City, OK USA
Comparison of Buckle Release Timing for Push-Button and Lift-Latch Belt Buckles *Final Report*
Gowdy, Van, Civil Aeromedical Inst., USA; George, Mark, Civil Aeromedical Inst., USA; McLean, G. A., Civil Aeromedical Inst., USA; February 1999; 12p; In English
Report No.(s): DOT/FAA/AM-99/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Small aircraft passenger restraint systems most commonly use lift-latch type buckle release mechanisms. Push-button buckle release mechanisms, similar to those used in contemporary automobiles, have rarely been used on passenger restraints. Although push-button buckles are not explicitly prohibited by Federal Aviation Administration (FAA) regulations, the human factors aspects of introducing push-button buckles in an aircraft environment are important considerations from the standpoint of safety. A test program was conducted by the FAA Civil Aeromedical Institute (CAMI) with volunteer human subjects to measure and compare the times it takes a passenger to release a push-button buckle on a 3-point restraint, a common lift-latch buckle on a 3-point restraint, and a lift-latch buckle on a common lap belt. Sixty subjects were tested in a repeated-measures counterbalanced test protocol, which included instrumentation to measure the response times to release the buckle. Response time for the subjects to exit the seat and press a remote button was also acquired. This report includes the physical profiles of the subjects, the test protocol, and a statistical summary of the results. Based on the data acquired in this project, there was no major difference in the response times of the human subjects to release or egress from a 3-point restraint with a push-button buckle, compared with a lift-latch buckle on a 3-point or a common lap belt restraint. This study was intended to address factors associated with the use of push-button buckles restraint systems in small airplanes. Any consideration of the use of push-button buckles on commercial transport aircraft passenger seats should include data on a broader range of human factors.
Author
Seat Belts; Commercial Aircraft; Safety; Aircraft Compartments; Regulations; Human Factors Engineering; Responses

19990025760 NASA Langley Research Center, Hampton, VA USA
Demonstration of Imaging Flow Diagnostics Using Rayleigh Scattering in Langley 0.3-Meter Transonic Cryogenic Tunnel
Shirinzadeh, B., NASA Langley Research Center, USA; Herring, G. C., NASA Langley Research Center, USA; Barros, Toya, Spelman Coll., USA; February 1999; 16p; In English
Contract(s)/Grant(s): RTOP 522-31-61-01
Report No.(s): NASA/TM-1999-208970; NAS 1.15:208970; L-17801; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The feasibility of using the Rayleigh scattering technique for molecular density imaging of the free-stream flow field in the Langley 0.3-Meter Transonic Cryogenic Tunnel has been experimentally demonstrated. The Rayleigh scattering was viewed with a near-backward geometry with a frequency-doubled output from a diode-pumped CW Nd:YAG laser and an intensified charge-coupled device camera. Measurements performed in the range of free-stream densities from 3 x 10(exp 25) to 24 x 10(exp 25) molecules/cu m indicate that the observed relative Rayleigh signal levels are approximately linear with flow field density. The absolute signal levels agree (within approx. 30 percent) with the expected signal levels computed based on the well-known quantities of flow field density, Rayleigh scattering cross section for N2, solid angle of collection, transmission of the optics, and the independently calibrated camera sensitivity. These results show that the flow field in this facility is primarily molecular (i.e., not contaminated by clusters) and that Rayleigh scattering is a viable technique for quantitative nonintrusive diagnostics in this facility.

Author

Rayleigh Scattering; Flow Visualization; Charge Coupled Devices; Nitrogen; Imaging Techniques; Transonic Wind Tunnels; Cryogenics

19990025974 Army Research Lab., Sensors Directorate, Adelphi, MD USA

Time-Varying Electrostatic Modeling Techniques

Hull, David M.; Jan. 1999; 5p; In English

Report No.(s): AD-A358654; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

ARL developed computer models and modeling techniques based on the Method of Moments, and has used them for some time to study electrostatic fields associated with targets, terrain clutter, and sensors of interest. Recent extensions to these unique ARL capabilities allow some dynamic conditions to be modeled as a time series of quasi-static models. These new techniques have enabled us to study the extremely low-frequency (ELF) effects of rotating helicopter blades on both airborne and remote sensors. Examples show how a dynamic helicopter model can be used to compute time-varying airborne fieldmeter calibration factors for aircraft charge and atmospheric electric field measurements, and remote ELF electric fields which might be detected by passive surveillance sensors.

DTIC

Computerized Simulation; Dynamic Models; Electric Fields; Electrical Measurement; Electrostatics; Extremely Low Frequencies; Helicopters

19990025976 Air Force Research Lab., Wright-Patterson AFB, OH USA

Missile Fin Heat Pipe Cooling *Final Report, 1 Jun. 1995 - 1 Jun. 1998*

Donovan, Brian D.; Chang, won S.; Gottschlich, Joseph M.; May 1998; 66p; In English

Contract(s)/Grant(s): Proj-ARMP

Report No.(s): AD-A358663; AFRL-PR-WP-TR-1998-2066; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The main objective of this project was to determine if heat pipe technology could be used to cool the portion of a missile's control surfaces heated by hot exhaust gas. The goal was to reduce the heat conducted into the body of the missile and its actuation rod. The small portion of the airfoil near the missile body heated by the exhaust plume is to be cooled by rejecting the heat to the large portion of the fin moving through ambient air. It is a ground-to-ground missile with a maximum speed of about Mach 0.75, but the evaporator will see exhaust gas (after shock) at mach 0.89 and 1213 K. The heat pipe was built inside a NACA 0015 airfoil of chord length 0.1143 m, the first 0.05 m of the fin will be heated by the exhaust plume. The report summarizes the aerodynamic heat and cooling approximations used, basic heat pipe theory, design specifications for the missile fin test article, transient heat pipe start-up calculations, experimental setup and testing of the proof-of-concept test article.

DTIC

Aerodynamic Heating; Control Surfaces; Design Analysis; Evaporators; Exhaust Gases; Heat Pipes; High Temperature Gases

19990026190 California Inst. of Tech., Pasadena, CA USA

Interaction of Chemistry, Turbulence, and Shock Waves in Hypervelocity Flow *Final Report*

Candler, G.; Dimotakis, P.; Hornung, H.; Leonard, A.; Meiron, D.; Jan. 25, 1999; 89p; In English

Contract(s)/Grant(s): F49620-93-1-0338; AF Proj. 3484

Report No.(s): AD-A359687; GALCIT-FM-98-10; AFRL-SR-BL-TR-99-0029; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Significant contributions were made in a four-year interdisciplinary experimental, numerical and theoretical program to extend the state of knowledge and understanding of the effects of chemical reactions in hypervelocity flows. The program addressed the key problems in aerothermochemistry that arise from the interaction between the three strongly nonlinear effects:

Compressibility; vorticity; and chemistry. Results included: (1) Discovery of dramatic damping effects of nonequilibrium vibration and chemistry on transition in hypervelocity flows; (2) Proper formulation of parameters for reacting blunt-body flows; (3) Effects of nonequilibrium chemistry in shock-on-shock interaction; (4) New experiments on, and correlation with theory of high-enthalpy flap-induced separation; (5) Computations of interaction of a shock wave with density interfaces and with compressible Hill's spherical vortex; (6) Extensive clarification of phenomena in supersonic shear flows using new diagnostic and computational tools; (7) New experiments and computations of hypervelocity double-cone flow yielded insights into vibration-dissociation coupling; (8) First-principles computations of electron collision cross-sections with diatomic molecules and CO2; and (9) Development of new diagnostic technique LITA for accurate non-intrusive joint measurement of gas properties.
DTIC

Turbulence; Chemical Reactions; Hypervelocity Flow; Aerothermochemistry; Nonequilibrium Flow; Supersonic Flow; Blunt Bodies; Compressibility; Reacting Flow; Shear Flow; Shock Wave Interaction; Transition Flow; Vorticity

19990026321 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn, Germany

Corrosion Fatigue of Structural Components

Schuetz, Walter, Industrieanlagen-Betriebsgesellschaft m.b.H., Germany; Fatigue in the Presence of Corrosion; March 1999; 9p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Corrosion fatigue is a very complex phenomenon, because two very different loading systems are acting together. In addition, its correct simulation in the lab- while relatively easy, if expensive, for fatigue alone - is nearly impossible for cost and duration reasons. Also, little is known about the corrosion environment of aircraft (and of ground vehicles). Components, always notched, behave differently from unnotched material specimens in corrosion fatigue. Therefore, materials tests are useless, it is necessary to test components, with their protection system, under the relevant variable amplitude stress-time history and to simulate also the typical sequence: Corrosion-Corrosion Fatigue-Corrosion etc., in order to obtain a result which corresponds to the real behaviour in service. This has never been done up to now - and would be very expensive anyway. One way out of this problem would be to corrosion-fatigue test components which have suffered corrosion damage in service. This has been done a number of times, as some papers in this Workshop show. Finally a number of rules for improving corrosion fatigue tests in the lab are presented, including the suggestion to fit "corrosion boxes" to some typical components of an aircraft during it's full scale fatigue test.
Author

Fatigue (Materials); Corrosion; Structural Failure; Aircraft Reliability; Aircraft Maintenance; Aircraft Structures; Fatigue Tests; Full Scale Tests; Corrosion Tests; Simulation

19990026325 Institute for Aerospace Research, Ottawa, Ontario Canada

Local Stress Effects of Corrosion in Lap Splices

Komorowski, J. P., Institute for Aerospace Research, Canada; Bellinger, N. C., Institute for Aerospace Research, Canada; Gould, R. W., Institute for Aerospace Research, Canada; Fatigue in the Presence of Corrosion; March 1999; 8p; In English; See also 19990026320; Sponsored in part by NCI Information Systems; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Corrosion pillowing in fuselage joints has been modelled using finite element techniques and close-form solutions and shown to result in very high stress, which may lead to non-surface breaking high aspect ratio cracks. These cracks have been identified in a number of transport aircraft. Fractographic studies identified intergranular corrosion and in some cases fatigue striations at the crack front. Corrosion may have a greater impact on the structural integrity of joints than previously recognized and may require durability and damage tolerance reassessments including corrosion damage scenarios.
Author

Fatigue (Materials); Structural Failure; Aircraft Maintenance; Cracks; Finite Element Method; Fuselages; Intergranular Corrosion; Stress Corrosion; Transport Aircraft; Lap Joints; Splicing

19990026337 Dayton Univ. Research Inst., OH USA

Risk Assessment of Fatigue Cracks in Corroded Lap Joints

Berens, Alan P., Dayton Univ. Research Inst., USA; West, J. Doug, Boeing Defense and Space Group, USA; Trego, Angela, Boeing Defense and Space Group, USA; Fatigue in the Presence of Corrosion; March 1999; 10p; In English; See also 19990026320; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

As part of a program to develop analytical tools for predicting and validating the effects of corrosion on fatigue life assessments, deterministic crack growth predictions were made for a test specimen that is representative of a transport fuselage lap joint. Fatigue tests had been performed using this specimen and the results were made available by the National Research Council of Canada. The test data provided the necessary information to define boundary conditions, cracking scenarios, and initiating crack size distributions as well as to validate predictions. In addition to corrosion severity, which was modeled by the metric of uniform

material thinning, the crack growth predictions also had to account for multiple site damage. This paper uses the lap joint specimen test data and the deterministic crack growth predictions to demonstrate a risk analysis approach for quantifying random effects of factors associated with corrosion damage. Stress intensity factors and crack growth are calculated for selected percentiles of assumed distributions of corrosive thinning. Output from these deterministic analyses are then used in the risk analysis program Probability of Fracture (PROF) to calculate conditional failure probability as a function of experienced cycles for the multiple sets of defined conditions. The results are interpreted by a comparison of risks for the various degrees of thinning and by an implied distribution of hours to reach a fixed failure probability for the assumed distributions of corrosive thinning.

Author

Fatigue Tests; Corrosion; Structural Failure; Crack Propagation; Cracks; Fatigue Life; Lap Joints; Fuselages; Fracturing

14
LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology

19990025670 Advisory Group for Aerospace Research and Development, Aerospace Medical Panel, Neuilly-Sur-Seine, France

Aeromedical Support Issues in Contingency Operations *Le Soutien Aeromedical Lors des Operations non Programmees*

September 1998; 420p; In English; In French, 29 Sep. - 1 Oct. 1997, Rotterdam, Netherlands; See also 19990025671 through 19990025721

Report No.(s): AGARD-CP-599; ISBN 92-836-0059-2; Copyright Waived; Avail: CASI; A18, Hardcopy; A04, Microfiche

These proceedings include the Technical Evaluation Report, two Keynote Addresses, 53 papers and the edited discussions of the Symposium sponsored by the North Atlantic Treaty Organization (NATO/RTO) Aerospace Medical Panel. It was held in Rotterdam, N-E from 29 September - 1 October 1997. Contingency Operations constitute military missions such as peacekeeping, humanitarian aid, peacemaking/enforcement, full scale offensive operations and relief operations other than war, such as aid to civil powers in counterterrorism and in natural disasters. Increasingly, these operations will involve greater NATO participation in the post "Post-Cold-War" era. Significantly, NATO nations are turning to the application of science and technology, particularly computer resources, to address the unique problems associated with Contingency Operations. From a medical standpoint, there are many logistic, support and environmental factors which impede effective health and critical care medicine in Contingency Operations. This Symposium considered both the aeromedical problems encountered and the role of technological solutions as aids to resolving the issues in: (a) sustained and continuous operations, (b) medical management in remote locations, (c) medical information, and (d) adaptation to operational conditions. These proceedings will be of interest to heads of military health services, military and civilian officers concerned with the health and safety of personnel in air and support operations, research scientists, and those requiring a state-of-the-art review of medical "lessons learned" in Contingency Operations.

Author

Conferences; Contingency; Medical Services; Operations Research; Research and Development; Human Factors Engineering; Medical Personnel; Telemedicine; Medical Equipment; Life Support Systems; Aerospace Medicine; Biological Effects; Aircraft Safety

19990025671 Royal Air Force, School of Aviation Medicine, Farnborough, UK

Sustained Air Operations: Prolonged Duty Overnight

Nicholson, A. N., Royal Air Force, UK; Stone, Barbara M., Defence Evaluation Research Agency, UK; Aeromedical Support Issues in Contingency Operations; September 1998; 14p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sustained air operations imply round-the-clock scenarios and, inevitably, prolonged duty overnight. The ability of crews to cope with such work-rest patterns depends to a large extent on obtaining sufficient sleep during critical rest periods. Hypnotics may be essential to ensure sleep as the rest periods themselves are limited in number and duration, and occur at all times of the day and night. However, even if good sleep is attained during all the available rest periods, there may still be much difficulty in sustaining alertness during duty overnight, particularly if the duty periods themselves are prolonged. This paper deals with the use of various potential interventions to sustain alertness during intensive air operations.

Author

Prolongation; Night; Alertness; Human Factors Engineering; Flight Crews; Aircraft Safety; Flight Safety; Aerospace Medicine; Biological Effects

19990025672 Armstrong Lab., Brooks AFB, TX USA
Aircrew Performance During Extended Simulated Bomber Missions
Whitmore, J., Armstrong Lab., USA; French, J., Armstrong Lab., USA; Armstrong, S., B-2 OT and E Team, USA; September 1998; 6p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Research was conducted to determine if fatigue impacted the performance of aircrew during long-duration bomber missions. Sustained flight in excess of 36 hours with only a minimal crew aboard was examined in two studies. Sixteen male USA Air Force B-1B bomber aircrew participated in the study. The participants served in crews of four and performed three 36-hour experimental periods (missions) in a high-fidelity B-1B simulator. The missions were interspersed with 36-hour rest breaks. Speech, cognitive, physiological (EEG, temperature), and subjective fatigue data were collected approximately every three hours for 11 trials per mission. A MANOVA analysis revealed a significant effect of trials for the aggregated measures (F(10,432) = 1.9885, p less than 0.0001). This result, along with trend analyses, indicated a strong diurnal pattern in nearly all of the dependent measures. End-mission performance was similar to beginning-mission performance. Crews were able to perform the missions successfully; however, several areas of increased risk due to fatigue were observed. Crew rest strategies prior to, during, and following a mission are discussed. A second study is described which evaluated three long-duration B-2 missions.
Author
Bomber Aircraft; Flight Crews; Pilot Performance; Flight Fatigue; Flight Safety; Aircraft Safety

19990025673 Paris V Univ., Lab. of Applied Anthropology, France
Rest Management and the Development of Signs of Fatigue in Pilots According to Work Shifts *Gestion des Repos et Evolution des Manifestations de Fatigue chez les Pilotes selon les Rotations*
Mollard, R., Paris V Univ., France; Cabon, P., Paris V Univ., France; Mourey, F., Paris V Univ., France; Bougine, S., Paris V Univ., France; Coblentz, A., Paris V Univ., France; September 1998; 10p; In French; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Fatigue in airplane pilots constitutes one of the most often mentioned factors among reasons for reduced work performance. One of the available sources of information concerns the ASRS (Aviation Safety Reporting System), which allows American crews to report incidents confidentially. Analysis of these responses indicates that fatigue is explicitly mentioned in 4% of the events. Nevertheless, one can assume that fatigue is partially responsible for more than 20% of these incidents, given that other factors, such as inattention and communication problems, are often cited. Moreover, when pilots refer to fatigue, its associated causes prove to be quite diverse. Some pilots attribute it to lack of sleep, whereas for others long workdays or heavy workloads constitute the main causes for fatigue. One of the most frequently seen areas of confusion concerns the concept of sleepiness. Many studies conducted in real-life situations suggest that sleepiness and fatigue represent different ideas.
Author
Work-Rest Cycle; Aircraft Pilots; Rest; Aerospace Medicine; Biological Effects; Flight Fatigue

19990025674 Armstrong Lab., Combined Stress Branch, Wright-Patterson AFB, OH USA
Evasive Maneuvers and High-G Flight Safety After Sleep Deprivation
Chelette, T. L., Armstrong Lab., USA; Esken, R. L., Armstrong Lab., USA; Tripp, L. D., Armstrong Lab., USA; Albery, W. B., Armstrong Lab., USA; September 1998; 10p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

It is a common situation in the current global reach/global power mission to require fighter pilots to deploy overseas on short notice and to require immediate duty. Up to thirty six hours of sleeplessness is a common status in this environment. The objective of this study was to assess the performance of trained simulator pilots performing flight relevant tasks in the stressful environment of high G under two conditions; rested and 24 hours of sleeplessness. Performance was also compared to self-assessment and self reported effort and fatigue. Limited data was collected concerning a 2-4 week lay-off from the task. Volunteers (eight men & eight women) were trained to fly the Dynamic Environment simulator in a closed loop configuration air combat maneuvering up to 9 Gz. Before and after each session, their total body isometric strength was measured. During each sortie, thirty performance measures at simultaneous multiple tasks were measured. After each session, subjects completed a subjective questionnaire and a standardized subjective workload assessment. Neither male nor female overall performance was significantly affected by sleep status, although individual tasks showed sensitivity; call-sign reaction time was longer by 33% and missile survival was considerably less likely. Also, perceived effort and physical demand were higher while perceived performance was lower when sleepless. Greater self reported effort on the anti-G straining maneuver correlated with better task performance and less post-G fatigue. Men are naturally stronger than women, however there was no significant decrease in strength due to G exposure in either the rested or sleepless conditions for either gender. Though sleep deprived pilots' subjective sensations may be that they are fatigued and unable to perform, objective measures show that their ability to conduct offensive maneuvers remains unchanged after 24 hours

without sleep. However, when conversion to uncertain and spatially demanding defensive maneuvers occurs, survival may be compromised.

Author

Sleep Deprivation; High Gravity Environments; Evasive Actions; Aircraft Maneuvers; Flight Crews; Pilot Performance; Aerospace Medicine; Biostimulation; Biological Effects; Aircraft Safety

19990025678 Netherlands Aerospace Medical Centre, Soesterberg, Netherlands

Pros and Cons of Strategic Napping on Long Haul Flights

Valk, P. J. L., Netherlands Aerospace Medical Centre, Netherlands; Simons, M., Netherlands Aerospace Medical Centre, Netherlands; September 1998; 6p; In English; See also 19990025670

Contract(s)/Grant(s): CAA-97.058; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Long haul operations involve rapid multiple time zone changes and long, irregular work schedules. These factors can result in sleep loss, circadian disruption, and fatigue with consequent effects on pilot's performance and alertness. A controlled nap in the cockpit is considered to be a useful countermeasure to inflight fatigue. Therefore, a study was conducted on the effects of a 40 minutes controlled rest period on the flight deck on crew performance and alertness. The alertness of the designated waking pilot, who has to remain alert while his colleague is resting, was explicitly assessed. Data was collected of 59 pilots, flying North-Atlantic B747-300 trips as scheduled in their regular duty roster. Pilots were equipped with a palmtop computer and an actigraph for objective and subjective assessment of quantity and quality of cockpit naps, alertness, and performance on a vigilance dual-task. During flights, measurements were performed before and after the rest period and before top of descent. It was found that a cockpit rest period improved alertness and performance of the rested pilots up to top of descent. Sleep during the rest period provided more improvement than rest alone. A number of designated waking pilots had difficulties in maintaining a sufficient level of alertness during the rest period of their colleague pilot. It is recommended to implement the use of preplanned controlled rest periods on the flight deck as a preventive fatigue countermeasure in 2- and 3-person flight deck operations. Measures to safeguard the alertness of designated waking pilots and guidelines to secure flight safety are discussed.

Author

Flight Safety; Aircraft Safety; Aerospace Medicine; Biological Effects; Flight Operations; Sleep Deprivation

19990025676 Netherlands Aerospace Medical Centre, Soesterberg, Netherlands

Early Starts: Effects on Sleep, Alertness and Vigilance

Simons, M., Netherlands Aerospace Medical Centre, Netherlands; Valk, P. J. L., Netherlands Aerospace Medical Centre, Netherlands; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Early starts and irregular work schedules might lead to disruption of sleep-wake rhythms with consequent sleep loss and fatigue. Fatigue is known to be a contributing factor to operational errors. The aim of this study was to determine the effects of early reporting times and irregular duty schedules on sleep, alertness and performance of pilots flying short-haul operations. Method: 6 Captains flying short-haul charters were measured during two 4-week periods. Subjects were equipped with a palmtop computer and an actigraph for subjective and objective measurement of sleep parameters, alertness, and performance on a vigilance dual-task. Each day subjects had to perform measurements before, during, and after flights and before and after the main sleep period. Results: It was found that pilots reporting before 06:00 a.m. had a significant shorter total sleep time, impaired sleep quality, and impaired performance both pre-flight and at top of descent, to a lesser degree, this also applied for reporting between 06:00 and 09:00 a.m. Degradation of sleep was most significant during the night prior to the start of a new duty period. Conclusion: Performance was primarily affected by inadequate sleep related to reporting times before 06:00 a.m. It is recommended that reporting times before 06:00 a.m. should be avoided, whenever possible. Pilots who have to report early, should try to anticipate insufficient sleep by advancing their sleep phase. This can only be achieved when early starts are planned on a regular basis. When irregular early starts are unavoidable, it should be considered to compensate for sleep reduction by planning sufficient time for recovery sleep.

Author

Sleep; Alertness; Wakefulness; Flight Fatigue; Aircraft Safety; Flight Safety; Aerospace Medicine; Biological Effects; Work-Rest Cycle

19990025635 Universidad Complutense, Dept. of Physiology, Madrid, Spain

Urinary Melatonin Excretion in Airline Pilots Submitted to Transmeridian Flights

Tresguerres, J., Universidad Complutense, Spain; Arizmavarreta, C., Universidad Complutense, Spain; Granados, B., Universidad Complutense, Spain; Martin, M., Universidad Complutense, Spain; Villamua, M. A., Universidad Complutense, Spain; Golombek, D., Universidad Complutense, Spain; Cardinali, D. P., Buenos Aires Univ., Argentina; September 1998; 4p; In English; See

also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Endogenous biological circadian rhythms are present in the majority of behavioural and physiological variables of all living organisms. These rhythms are entrained to the external environment in which they live, and get desynchronized as a consequence of transmeridian flights. This study has investigated changes occurring in various biological markers in air line pilots during and after westbound (Madrid-Mexico) and eastbound (Madrid-Tokyo) flights. The results have been compared to those of a non flying control group over a 6 day period. A clear cut activity rhythm adapted to the local "Zeitgeber" was present over the whole period in controls as well as an evident rhythm in the urinary excretion of 6 sulfatoxy melatonin. Pilots showed alterations of the melatonin rhythm already on the day before of the flight, probably due to the desynchronizing effects of previous transmeridian flights. to Mexico, the rhythm remained adapted to Madrid in the first day and started to get adjusted to local time the second day. Pilots older than 50 years showed a higher resistance to change their excretory rhythm, to adjust to the local environment. The return flight to Madrid occurred in the middle of maximal 6 sulfatoxy melatonin excretion. Experimental subjects flying to Tokyo showed a complete disruption of the hormonal excretory, and of the activity rhythms. All subjects showed tiredness and anxiety at the end of the flights, being at a maximum when arriving to Tokyo. Pilots did not completely recover before the return flight. Author

Aircraft Pilots; Hormones; Circadian Rhythms; Jet Lag; Desynchronization (Biology); Flight Stress (Biology); Human Performance; Physiological Effects

19990025686 Army Aeromedical Research Lab., Fort Rucker, AL USA

Aviator's Grounding Time After Melatonin Administration During Rapid Deployment Missions

Comperatore, Carlos A., Army Aeromedical Research Lab., USA; Wright, Darlene, Army Aeromedical Research Lab., USA; Day-Clayton, Melanie, Army Aeromedical Research Lab., USA; Rinvera, Pik, Army Aeromedical Research Lab., USA; Bey-Wright, Regina, Army Aeromedical Research Lab., USA; Kirby, Albert W., Universal Energy Systems, Inc., USA; September 1998; 10p; In English; See also 19980025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

The determination of drug-induced grounding time for aviation personnel can be derived from the drug's half-life, the assessment of hangover effects, and the evidence that sleep, alertness, and cognitive functions are normal some time after administration. Melatonin's half-life has been reported at approximately 60 minutes. Its side effects, particularly in the case of low doses no greater than 1 mg, generally are limited to drowsiness during the first 2 h after administration. This would imply that grounding time would be minimal for regimens employing 1 mg or less. However, the use of melatonin in rapid military deployments depends upon the development of regimens which can induce large advances or delays of circadian rhythms in relatively short periods of time (1-2 days).

Derived from text

Circadian Rhythms; Hormones; Aircraft Pilots; Pilot Performance; Half Life

19990025690 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

Experiences of the Critical Care Air Transport Teams (CCATT) During Operation Joint Endeavor

Hersack, Rick, Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Beninati, William, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; Morales, Carlos, Air Force Medical Center, USA; Derdak, Stephen, Air Force Medical Center, USA; Farmer, J. Christopher, Air Force Medical Center, USA; September 1998; 4p; In English; See also 19980025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

For the past year, Critical Care Air Transport Teams (CCATT's) from Keesler Medical Center, Keesler AFB, Mississippi and Wilford Hall Medical Center, Lackland AFB, Texas have been deployed to support Operation JOINT ENDEAVOUR (OJE), the NATO peace effort in Bosnia. This is the largest operation involving the use of the CCATT's to date. A CCATT consists of a physician specializing in intensive care medicine, a critical care nurse, and a cardiopulmonary technician. The CCATT uses transport monitors, ventilators, portable blood analyzers and other medical equipment commonly used in our medical centers' intensive care units. The CCATT augments the standard aeromedical evacuation aircrew so that critically ill or injured patients may be evacuated from forward areas to definitive care hospitals. Otherwise, field hospitals in forward areas would have to provide care for these patients until they were stable enough to travel unaccompanied, creating huge logistical demands, or provide a physician to accompany the patient during evacuation, leaving forward field hospitals understaffed. Providing increased clinical capabilities aboard patient evacuation flights is not new. Several other nations' military medical services have extensive experience using enroute care providers to manage critically ill or injured patients during evacuation. During one year of the OJE deployment, the CCATT's moved 44 patients in 42 missions. Of these patients, 22 required mechanical ventilation during the flight. Eight missions were transatlantic flights to return patients to treatment facilities in the USA. CCATT's also redeployed to support the evacuation of foreign nationals from Liberia and rescue operations after the Khobar Towers Bombing in Dhahran. With the end of the "Cold

War", a shift in military medical planning now calls for a reduced medical presence in areas of conflict and a subsequent increased reliance on patient movements out of theater for definitive medical and surgical care. The CCATT concept is an effective solution that fills the need for long range critical care air evacuation and easily integrates into the current aeromedical evacuation system.
Derived from text

Air Transportation; Patients; Medical Services; Military Operations; Rescue Operations

19990025691 Aeromedical Evacuation Squadron (0043rd), Pope AFB, NC USA

Evolving Doctrine in the Theater Aeromedical Evacuation System (TAES): Operation JOINT ENDEAVOR/GUARD and Beyond

Miller, P. M., Aeromedical Evacuation Squadron (0043rd), USA; September 1998; 4p; In English. See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

With an increase in contingency operations in the NATO theater of operations, the Theater Aeromedical Evacuation System (TAES) needs to be flexible to meet the ever-changing demands of both combat operations and military operations other than war. Recent evolution in USA medical evacuation policies have made it necessary for the TAES to also change the way it does business. This paper discusses the composition of the TAES, recent additions to the TAES, trends in US medical policies, and implementation of the TAES during Operation JOINT ENDEAVOR/GUARD.
Derived from text

Medical Services; Evacuating (Transportation); Military Operations; Air Transportation

19990025692 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

The Mobile Field Surgical Team (MFST): A Surgical Team for Combat Casualty Care in the Information Age

Carlton, P. K., Air Force Medical Center, USA; Pilcher, John, Air Force Medical Center, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The current military medical system is designed to support 20th century combat: the forces involved in the conflict were large, powerful, and ponderous. Medical planning for conflicts such as these included several assumptions about the conditions involved (1) Discrete build-up phase - medical units would have time to assemble their assigned personnel and materials, and would be permitted to set up these facilities before use of the facilities would be required; (2) Large number of casualties; (3) Definitive care in theater - lines of battle were fairly stable; thus injured personnel would be treated in-theater until they reached a convalescent phase. At that point they would be returned to duty or evacuated from the theater; and (4) Traditional evacuation system - the Air Evacuation system would serve to transport patients who had been injured, but had essentially no ongoing requirements for medical care. The assets that were developed to meet the medical needs of these conflicts (the Air Transportable Hospital (ATH), Combat Support Hospital (CSH), and Fleet Hospital) are very capable and offer a variety of medically oriented services. They are essentially full-service hospitals packaged in a format that can be moved by air or sea. As full-service hospitals, they are quite large and heavy, and they require a significant amount of time and space to set up. The ATH (for example) is intended to be deployed in a modular or "building block" fashion, but this is implemented by bringing primary care capability into the theater first. Thus a full 80-bed ATH is necessary before trauma surgery or even an appendectomy can be performed. This set of equipment is packaged on 82 pallets, requiring airlift of seven C-141 aircraft.
Derived from text

Surgery; Support Systems; Air Transportation; Casualties; Deployment

19990025693 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

The Provision of Intensive Care Medicine in Austere Field Locations

Farmer, J. Christopher, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Kilpatrick, Russell, Air Force Medical Center, USA; Derdak, Steven, Air Force Medical Center, USA; Hersack, Richard, Air Force Medical Center, USA; Morales, Carlos, Air Force Medical Center, USA; King, Jim, Air Force Medical Center, USA; Ramon, Jose, Air Force Medical Center, USA; Benimati, Bill, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Guz, Evan, Air Force Medical Center, USA; Biggers, Butch, Air Force Medical Center, USA; September 1998; 5p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Technologic advances have made laboratory testing feasible at the bedside. Point-of-care testing (POCT) allows medical providers to assess a wide range of clinical conditions in a rapid fashion at the site of patient interaction. While POCT has begun to impact on the delivery of care in the hospital setting, its potential for use in remote, field environments or during aeromedical evacuation is just being realized. In the civilian setting, discussion of POCT focuses on regulatory guidance, cost effectiveness, and reimbursement. Little attention has been paid in the literature to expanding the use of these capabilities beyond the traditional hospital boundaries. In this paper, we will briefly review the development of POCT and the associated technology. In addition,

we will discuss the potential role of POCT in the field using current technology. Finally, we will review the available literature on use of POCT in the field.
Derived from text
Evacuating (Transportation); Medical Services; Cost Effectiveness; Air Transportation

19990025695 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA
Use of Point of Care (POC) Laboratory Devices by Critical Care Air Transport Teams (CCATT) of the USA Air Force
Lawlor, Dennis, Air Force Medical Center, USA; Grissom, Thomas, School of Aerospace Medicine, USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Point of Care (POC) laboratory devices have recently been utilized in medical centers to provide rapid results at the bedside of critically ill patients. The locations most commonly targeted are the Intensive Care Unit, the Operating Room, the Recovery Room and the Emergency Room. The impetus to use these devices is to provide immediate, accurate results of several critical laboratory values, especially those values that can change quickly. Instruments that can measure pCO_2, pO_2, pH, hemoglobin, hematocrit, sodium, potassium, chloride, glucose, urea, and ionized calcium and provide results in several minutes are already available. Technological requirements for a POC device include being small (less than 10 pounds), use small quantities of blood, can use AC or DC current, and require a minimum of effort to calibrate.
Derived from text
Air Transportation; Potassium Chlorides; Sodium Chlorides; Emergencies; Patients; Hemoglobin; Glucose; Hematocrit

19990025696 Walter Reed Army Inst. of Research, Div. of Surgery, Washington, DC USA
Life Support for Trauma and Transport (LSTAT(trademark)): A NATO Litter-Based Critical Care Transport Platform
Pearce, F. J., Walter Reed Army Inst. of Research, USA; Wiesmann, W. P., Army Medical Research and Materiel Command, USA; Hale, J., Armstrong Lab., USA; Licina, J. R., Army Aeromedical Research Lab., USA; September 1998; 4p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

A significant portion of the military field medical footprint is currently consumed by post surgical patients, which according to current doctrine, must be stable before evacuation. This requirement results in a significant logistical burden for our ground forces. At present, we do not have adequate monitoring or therapeutic capabilities during ground or air transport to a definitive care treatment facility. In response to this need, we initiated a research and development activity to design and build a NATO-stretcher-based mini-intensive care unit that incorporates resuscitative and life-sustaining capabilities for field surgery and en route care. The LSTAT(trademark) has 3 basic components: (i) the base unit; (ii) a NATO stretcher; and (iii) a canopy that covers the entire patient. The LSTAT(trademark) base contains medical, diagnostic and therapeutic components while medical parameters, system performance data and user interactions are continuously monitored and logged by an on-board CPU. Provision is made for storage of up to 36 hours of physiologic and system performance data which can be uploaded to a local or remote host computer. When necessary, this data can also be communicated to the receiving hospital during evacuation for review by physicians to aid in their medical preparations for treatment. This facility provides a new life support capability for transport of marginally stable or unstable patients which integrates with existing NATO evacuation platforms.
Derived from text
Life Support Systems; Air Transportation; Physiology; Diagnosis; Surgery

19990025698 Department of the Air Force, Nurse Corps, Brooks AFB, TX USA
Spinal Cord Injury Transport System
Mason, Barbara-Marie, Department of the Air Force, USA; September 1998; 2p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

The USA Air Force Air Mobility Command (AMC) is tasked to provide the aeromedical evacuation of casualties in routine and contingency operations. to carry out this mission, AMC needs a medical support system suitable for transporting patients with spinal cord injuries and all types of extremity and cervical traction requirements. This piece of equipment would be a Spinal Cord Injury Transport System (SCITS). The current method for transporting these patients is on the Stryker Turning Frame with a Collins Traction Device, for cervical traction. The system has been in use for over 20 years and is no longer logistically supported and must be replaced. The replacement system should provide a quality of care comparable to that available in fixed (ground) medical treatment facilities; i.e., a system that provides traction and kinetic therapy through incremental side-to-side rotation. Although SCITS will primarily be used for the previously mentioned patients, it would be beneficial and used for a variety of other

patient conditions such as multiple trauma, burns, chest wounds, pulmonary complications, and post operative, depending on availability.

Derived from text

Spinal Cord; Injuries; Air Transportation; Evacuating (Transportation); Medical Services; Support Systems; Casualties

19990025699 Department of the Air Force, Nurse Corps, Brooks AFB, TX USA

Advanced Hybrid Oxygen System-Medical

Mason, Barbara-Marie, Department of the Air Force, USA; September 1998; 2p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

In 1993, a human system need request was submitted by Air Mobility Command to the Human Systems Center Plans and Program Office. This document tasked the aeromedical systems division to determine the feasibility of a hybrid oxygen system that could support the flight crew, patients and passengers on board an aircraft. What is currently available for flight crew is a variety of oxygen systems. There are liquid oxygen (LOX) systems, gaseous oxygen and onboard oxygen generating systems. The Patient Therapeutic LOX system is currently used for the patient therapeutic oxygen and passenger supplemental oxygen onboard some aeromedical evacuation aircraft. The limitations of existing onboard oxygen generating systems are they are not capable of generating or storing sufficient oxygen to meet patient and passenger needs.

Derived from text

Aerospace Medicine; Oxygen Supply Equipment; Liquid Oxygen; Air Transportation; Evacuating (Transportation); Flight Crews; Medical Services

19990025700 School of Aerospace Medicine, Brooks AFB, TX USA

Mechanical Ventilator Performance During Aeromedical Evacuation

Grissom, Thomas E., School of Aerospace Medicine, USA; Papier, Kenneth S., Air Force Medical Center, USA; Lawlor, Dennis, Air Force Medical Center, USA; Farmer, J. Christopher, Air Force Medical Center, USA; Derdak, Stephen, Air Force Medical Center, USA; September 1998; 8p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A02, Hardcopy; A04, Microfiche

Current USA military medical planning calls for a decreased medical presence in areas of conflict with increased reliance on patient movements out of theater for more definitive medical and surgical care. As a result, the aeromedical evacuation system will be moving patients with critical conditions and injuries faster and further than during past contingencies. This will include the movement of an increasing number of patients requiring mechanical ventilatory support. Advances in ventilator technology have led to the introduction of smaller and more capable transport ventilators. Some of these ventilators use built in air compression devices which remove the necessity of carrying an external compressor. In addition, manufacturers have incorporated newer modes of ventilation to improve patient tolerance of mechanical ventilation and provide the user with route care capability for the critically injured or ill patient.

Derived from text

Ventilators; Oxygen Consumption; Military Operations; Evacuating (Transportation); Air Transportation; Medical Services

19990025713 Air Force Medical Center, 59th Medical Wing, Lackland AFB, TX USA

The Potential Uses of Telemedicine to Augment Critical Care In-the-Air

Farmer, J. Christopher, Air Force Medical Center, USA; Carlton, P. K., Jr., Air Force Medical Center, USA; Kilpatrick, Russell, Air Force Medical Center, USA; Derdak, Steven, Air Force Medical Center, USA; Beninati, Bill, Air Force Medical Center, USA; Grissom, Thomas, Air Force Medical Center, USA; September 1998; 3p; In English; See also 19990025670; Copyright Waived; Avail: CASI; A01, Hardcopy; A04, Microfiche

Recent advances have allowed us to expand the relm of intensive care medicine into the aeromedical evacuation arena. The rate limiting step to the full scale development of this concept is sufficient numbers readiness directed numbers would not be gainfully employed during a peace time environment. Therefore, we must look to alternate personnel sources to provide this care with sophisticated medical backup. In this regard, telemedicine provides an excellent vehicle to leverage the sophisticated medical care into the hands of other healthcare providers with intensivists backup. Air to ground telemedicine may expand the functionality of available non-physical providers during military medical contingency operations.

Derived from text

Telemedicine; Military Operations; Medical Services; Air Transportation; Medical Equipment; Teleconferencing

19990025333 Civil Aeromedical Inst., Oklahoma City, OK USA

The Role of Shift Work and Fatigue in Air Traffic Control Operational Errors and Incidents *Final Report*

DellaRocco, Pamela S., Editor, Civil Aeromedical Inst., USA; January 1999; 32p; In English

Report No.(s): DOT/FAA/AM-99/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report was developed from a collaborative effort between the FAA Civil Aeromedical Institute's (CAMI's) Shift Work and Fatigue Research Program and the National Aeronautics and Space Administration (NASA) Ames Research Center's Fatigue Countermeasures Program. The purpose of this report was to examine existing databases to assess the extent to which shift work and fatigue might be factors associated with incidents and errors in air traffic control (ATC) operations. The first study in this report examined the Aviation Safety Reporting System (ASRS) database, a voluntary reporting system administered and maintained by NASA. The ASRS database was searched for reports concerning ATC incidents. of the 5773 ATC reports in the database, a search of 19 fatigue-related keywords identified 153 (2.7%) reports referencing controller-related fatigue in the narrative section of the ASRS incident report. These reports spanned the years from 1988 to 1996. These reports were categorized by year of occurrence, aircraft type, fatigue category, incident type, time of day, day of the week, and lighting condition. Controller fatigue was the most commonly identified category in the 153 fatigue-related reports, followed by workload and duty or scheduling factors. Fatigue was reported as a performance-impairing factor affecting personnel at all times of the day, in all types of operations, and manifested itself in a variety of anomalies in ATC operations. The second study in this report examined the Operational Error/Deviation System (OEDS) database, a mandatory reporting system managed and operated by the FAA. A total of 3222 records was examined. These reports spanned the years from 1988 to 1994. The analyses in this study included: (1) descriptive statistics for shift work-related variables; 2) correlations between shift work variables and severity of OEDS; and (3) Chi-square analyses of causal factors and shift type. Frequency counts revealed that 80% of OEDs occurred between 0800 and 1900 and nearly 50% of errors occurred within the first 30 minutes on position, usually upon returning from a break. None of the shift work variables was a strong predictor of the severity of operational errors. Data-posting types of errors were more likely on the midnight shift, possibly reflecting declines in alertness and vigilance on that shift. Unfortunately, many of the variables related to shift schedules and fatigue were unable to support much analysis because of data quality problems and confounding with air traffic volume. to adequately assess the changes in OED rates as they relate to time of day, in estimate of exposure is needed.

Author

Air Traffic Control; Schedules; Workloads (Psychophysiology); Alertness; Errors; NASA Programs; Aircraft Safety; Fatigue (Biology)

19990025334 Civil Aeromedical Inst., Oklahoma City, OK USA

Concepts Providing for Physiological Protection after Aircraft Cabin Decompression in the Altitude Range of 60,000 to 80,000 Feet Above Sea Level *Final Report*

Garner, Robert P., Civil Aeromedical Inst., USA; February 1999; 18p; In English

Report No.(s): DOT/FAA/AM-99/4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The European aircraft Concorde provides evidence that the technology required for building supersonic passenger transport has long been available. In the USA, development efforts for this type of airplane were functionally abandoned in the early 1970s. In recent years, changes in technology, world political structures, and economics have stimulated interest in the development of a fleet of supersonic transports for use in civilian aviation. The future aircraft has been designated the High Speed Civil Transport (HSCT). As part of the development process, all potential challenges associated with design characteristics of the aircraft must be addressed. This report reviews the physiological issues related to cabin decompression during high-altitude flight. A number of strategies for protecting passengers and crewmembers after high-altitude cabin decompression are discussed. Due to the physiological consequences associated with high-altitude decompression, a combination of protective systems may be necessary. At a minimum, it would appear that increased structural integrity of the cabin, a repressurization system, and an optimally designed supplemental oxygen system for crew and passengers are required.

Author

Aircraft Compartments; Pressure Reduction; Structural Failure; Design Analysis; Physiology; High Altitude

19990025834 Texas A&M Univ., College Station, TX USA

System Study of a Surface Habitat and a Transit Vehicle for a Manned Mission to and From Mars

Brown, Tony, Texas A&M Univ., USA; Hebert, Brian, Texas A&M Univ., USA; Hestilow, Colin, Texas A&M Univ., USA; Rogers, Jeff, Texas A&M Univ., USA; Syke:, Starlee, Texas A&M Univ., USA; McConnell, Joshua, Editor, Texas A&M Univ., USA; HEDS-UP Mars Exploration Forum; 1998, pp. 157-170; In English; See also 19990025822; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The continued technology advancement over the last several decades has provided the impetus for ambitious individuals to look towards exploration and possible settlement of the frontiers that exist beyond the boundaries of Earth. NASA has expressed a need for the development of a system to provide life sustaining functions for the duration of a three phase mission to and from Mars, including a 500 day expedition on the surface. A preliminary design for a Mars habitation and transportation system was developed to fulfill the need expressed by NASA after down-selecting from several conceptual designs. The design team assigned to this task was divided into subteams responsible for key function groups. These function groups are avionics, power and mobility, environmental controls and life support (ECLSS), and structures. This systems report gives an overview of the total system with attention given to each of these key functional groups. For further information and detail on a specific functional group, refer to the individual reports for that function group. The problem definition section of the report includes the need statement and need analysis, from which the specific need is expressed and the key system constraints imposed. The major functions resulting from the need analysis were that the habitation and transportation system must provide transportation, meet the constraints imposed by the shuttle, provide habitation needs, and allow for a Martian surface expedition. Following the function structure are the functional and performance requirements, which allocate specific numbers and constraints to particular concepts of the need. Calculations as well as assumptions are involved in the process of determining system performance requirements. The system description contains basic drawings of the system and a description of major interfaces. A failure modes and effects analysis and a summary of component costs of the system are also included.

Author

Environmental Control; Functional Design Specifications; Life Support Systems; Mars Surface; Manned Mars Missions; Mars Exploration; Space Habitats; Closed Ecological Systems; Avionics; Space Rations

15
MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19990025604 Joint Advanced Distributed Simulation Joint Test Force, Albuquerque, NM USA

The Benefits of Using Advanced Distributed Simulation for Air- to -Air Missile Test and Evaluation

McKee, Larry; Nov. 1998; 11p; In English

Report No.(s): AD-A359339; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Joint Advanced Distributed Simulation (JADS) Joint Test and Evaluation (JT&E) was chartered by the Office of the Secretary of Defense (Acquisition and Technology) in October 1994 to investigate the utility of advanced distributed simulation (ADS) technologies for support of test and evaluation (T&E). The JADS Joint Test Force (JTF) conducted a System Integration Test (SIT) in which ADS was used to support the testing of an integrated missile weapon/launch aircraft system in operationally realistic scenarios. The SIT scenarios simulated a single shooter aircraft launching an air-to-air missile against a single target aircraft. Extensive testing was performed involving two different ADS architectures: (1) A linked laboratory configuration in which the shooter and target were represented by manned flight laboratories and the missile by an AIM-9M Sidewinder hardware-in-the-loop (HWIL) laboratory. (2) A live shooter/target configuration in which the shooter and target were represented by live F-16 fighters and the missile by an AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) HWIL laboratory. Testing was completed in October 1997, and evaluation of the results Supports the conclusion that each ADS configuration has utility for T&E of the corresponding air-to-air missile involved. This paper discusses the following: (1) Description of the two different architectures utilized in the SIT testing. (2) Technical challenges in implementing ADS. (3) Lessons learned from implementing ADS. (4) Conclusions on the utility of ADS-based testing of air-to-air missiles. (5) Benefits of implementing AD S-based testing of air-to-air missiles.

DTIC

Systems Integration; Targets; Missile Tests; Missile Systems; F-16 Aircraft

19990026291 Naval Postgraduate School, Monterey, CA USA

Vision Guidance Controller for an Unmanned Aerial Vehicle

Watson, Mark T.; Dec. 1998; 94p; In English

Report No.(s): AD-A359702; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The use of Unmanned Aerial Vehicles (UAVs) in modern military operations for reconnaissance and other missions continues to grow. UAV systems using remote control guidance are limited in range and subject to Electronic Warfare concerns. Guidance Systems using only Global Positioning Service (GPS) or an Inertial Navigation System (INS) are limited to a pre-programmed

route of flight. A vision guidance system that can control the UAV over an arbitrary course is not subject to these limitations. This thesis uses classical control methods to develop and test an autonomous vision controller for the FOG-R UAV (FROG). First, a computer model of the camera output for a flight that tracks a river is made to develop the controller and to test it in nonlinear simulation. Finally, the complete system is flight tested on the FROG UAV. The design and test equipment include a highly modified FOG-R UAV from the U.S. Army, the MATRIXx Product Family of software tools developed by Integrated Systems, Inc., and a Ground Station built at NPS from commercially available computer and communication equipment.
DTIC
Controllers; Global Positioning System; Interprocessor Communication; Pilotless Aircraft; Remote Control; Military Operations; Nonlinear Systems

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PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19990025952 NASA Lewis Research Center, Cleveland, OH USA
Subsonic Jet Noise from Non-Axisymmetric and Tabbed Nozzles
Tam, Christopher K. W., Florida State Univ., USA; Zaman, K. B. M. Q., NASA Lewis Research Center, USA; 1999; 13p; In English; 37th; Aerospace Sciences, 11-14 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-2102; NAG1-1776
Report No.(s): AIAA Paper-99-0077; Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA 20191), Hardcopy, Microfiche

Subsonic jet noise from non-axisymmetric and tabbed nozzles are investigated experimentally and theoretically. It is shown that the noise spectra of these jets are in good agreement with the similarity spectra found empirically earlier by Tam, Golebiowski and Seiner through a detailed analysis of supersonic jet noise data. Further, the radiated noise fields of the jets under study, including elliptic and large aspect ratio rectangular jets, are found to be quite axisymmetric and are practically the same as that of a circular jet with the same exit area. These experimental results strongly suggest that nozzle geometry modification into elliptic or rectangular shapes is not an effective method for jet noise suppression. A lobed nozzle, on the other hand, is found to significantly impact the noise field. Noise from large scale turbulent structures, radiating principally in the downstream direction, is effectively suppressed. Tabs also impact the noise field, primarily by shifting the spectral peak to a higher frequency. A jetlets model is developed to provide a basic understanding of the noise from tabbed jets. The model predicts that the noise spectrum from a jet with N tabs (N greater than or equal to 2) can be obtained from that of the original jet (no tab) by a simple frequency shift. The shifted frequency is obtained by multiplying the original frequency by N(exp 1/2). This result is in fairly good agreement with experimental data.
Author
Subsonic Flow; Tabs (Control Surfaces); Aerodynamic Noise; Jet Aircraft Noise; Engine Noise; Noise Spectra; Nozzle Flow

19990026103 Dayton Univ. Research Inst., Research Inst., OH USA
Combustion and Heat Transfer; Volume 1 - Advanced Jet Fuels Data Studies *Final Report, 8 Jun. 1992 - 31 Dec. 1997*
Zabarnick, S.; Ballal, D. R.; Binns, K. E.; Dieterle, G. L.; Ervin, J. S.; Apr. 1998; 225p; In English
Contract(s)/Grant(s): F33615-92-C-2207; AF Proj. 3048
Report No.(s): AD-A359360; UDR-TR-1998-00035-VOL-1; AFRL-PR-WP-TR-1998-2067; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report highlights studies performed in support of the development of advanced jet fuels, including JP-8+100, JP-900, and endothermic fuels. For the development of JP-8+100 fuel, we have tested hundreds of additives in both small and large scale test devices. We formulated combinations of the best additives (detergent/dispersant, hindered phenol antioxidant, and metal deactivator) and demonstrated their efficacy in reducing deposition under realistic aircraft conditions in large-scale simulator rigs. We optimized the concentrations of these additives for maximum effectiveness and minimum cost. We performed extensive studies of the compatibility of these fuel additives with current and future aircraft fuel system materials. We determined that the current best additives show no negative effects on both metallic and non-metallic fuel system materials. We also performed extensive

studies on the fundamental processes of fuel oxidation, deposition, and pyrolysis. We made progress in support of development of future fuels such as JP-900 and endothermic fuels. Data set summaries of the much of the data obtained during the contract period are contained in the accompanying volume entitled, "Combustion and Heat Transfer; Volume 2 - Advanced Jet Fuels Data Sets."
DTIC
Combustion; Jet Engine Fuels; Endothermic Reactions; Aircraft Fuel Systems; Heat of Combustion

19990026104 Dayton Univ. Research Inst., Research Inst., OH USA
Combustion and Heat Transfer; Volume 2 - Advanced Jet Fuels Data Sets *Final Report, 8 Jun. 1992 - 31 Dec. 1997*
Zabarnick, S.; Ballal, D. R.; Binns, K. E.; Dieterle, G. L.; Ervin, J. S.; Apr. 1998; 137p; In English
Contract(s)/Grant(s): F33615-92-C-2207; AF Proj. 3048
Report No.(s): AD-A359361; UDR-TR-1998-00036-VOL-2; AFRL-PR-WP-TR-1998-2068; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report consists of data set summaries of tests performed in support of the development of advanced jet fuels, including JP-84100, JP-900, and endothermic fuels. This includes data sets for the quartz crystal microbalance (QCM), the isothermal corrosion oxidation test (ICOT), the Phoenix rig, the fuel/materials compatibility studies, the extended duration thermal stability test (EDTST), and the advanced reduced scale fuel system simulator (ARSFSS). These data sets, and/or more complete versions of them, may also be available in electronic format on the internet at https://posfbbs.appl.wpafb.af.mil or directly from the authors. The overall program accomplishments and details of the individual test devices employed during the contract period are contained in the accompanying volume entitled, "Combustion and Heat Transfer; Volume 1 - Advanced Jet Fuels Studies."
DTIC
Heat Transfer; Combustion; Jet Engine Fuels; Heat of Combustion; Corrosion Tests; Fuel Systems

19990026295 Boeing Co., Mesa, AZ USA
A User's Manual for ROTTILT Solver: Tiltrotor Fountain Flow Field Prediction
Tadghighi, Hormoz, Boeing Co., USA; Rajagopalan, R. Ganesh, Iowa State Univ. of Science and Technology, USA; January 1999; 88p; In English
Contract(s)/Grant(s): NAS1-20096; RTOP 576-03-14-10
Report No.(s): NASA/CR-1999-208973; NAS 1.26:208973; L9KVJC-FR-98001; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A CFD solver has been developed to provide the time averaged details of the fountain flow typical for tiltrotor aircraft in hover. This Navier-Stokes solver, designated as ROTTILT, assumes the 3-D fountain flowfield to be steady and incompressible. The theoretical background is described in this manual. In order to enable the rotor trim solution in the presence of tiltrotor aircraft components such as wing, nacelle, and fuselage, the solver is coupled with a set of trim routines which are highly efficient in CPU and suitable for CFD analysis. The Cartesian grid technique utilized provides the user with a unique capability for insertion or elimination of any components of the bodies considered for a given tiltrotor aircraft configuration. The flowfield associated with either a semi or full-span configuration can be computed through user options in the ROTTILT input file. Full details associated with the numerical solution implemented in ROTTILT and assumptions are presented. A description of the surface mesh topology is provided in the appendices along with a listing of all preprocessor programs. Input variable definitions and default values are provided for the V22 aircraft. Limited predicted results using the coupled ROTTILT/WOPWOP program for the V22 in hover are made and compared with measurement. to visualize the V22 aircraft and predictions, a preprocessor graphics program GNUPLOT3D was used. This program is described and example graphic results presented.
Author
User Manuals (Computer Programs); Computational Fluid Dynamics; Rotors; Flow Distribution; Computational Grids; Aircraft Configurations

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SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

19990026305 Farrar (David J.), Wing, UK

New Opportunities and Stubborn Problems in Engineering Design

Farrar, David J., Farrar (David J.), UK; Directing and Managing Cost-Effective Design: Proceedings; 1998, pp. 4.1-4.9; In English; See also 19990026302; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Stubborn problems include suboptimization, which in changing forms has persisted in aerospace over the past fifty years. The theme is illustrated from, case histories covering Government procurement, industry direction and management and design education, much of which comes from the authors, involvement in successes and failures, and conversations with and surveys of hundreds of engineers and designers. Benchmarking of company performance in this field shows much scope for improvement. Case histories show how major steps forward were directed and managed. Practical opportunities for improvement are listed and discussed.

Author

Case Histories; Aircraft Industry; Aircraft Design; Design to Cost; Design Analysis; Management Planning; Project Planning; Cost Reduction

19990026332 Analytical Processes/Engineered Solutions, Inc., Saint Louis, MO USA

Corrosion is a Structural and Economic Problem: Transforming Metrics to a Life Prediction Method

Brooks, Craig L., Analytical Processes/Engineered Solutions, Inc., USA; Prost-Domasky, Scott, Analytical Processes/Engineered Solutions, Inc., USA; Honeycutt, Kyle, Analytical Processes/Engineered Solutions, Inc., USA; Fatigue in the Presence of Corrosion; March 1999; 12p; In English; See also 19990026320; Sponsored in part by NCI, Inc.

Contract(s)/Grant(s): NCI-USAF-90061-007; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper advocates a basic engineering approach to compute the effects of corrosion on structural capability. The analyses use fracture mechanics methods and fundamental engineering principles. Engineering computations are combined with damage tolerance assessment concepts to formulate a model to approximate the life degradation effects of corrosion. The methods and assumptions used in the analyses are based on reasonable physical characteristics. Where scientific data is unknown, rational judgements are made and several options are explored to bracket the results in terms of the assumptions. Sensitivities of the parameters are examined to establish overall relevance of results. Although the life predictions are calculated using deterministic techniques, the scope of the problem and thus the life impacts computed should be considered as probabilistic. The results of this approach provide the analyst with numerical impacts of potential scenarios and a means for quantifying the effects of corrosion with fatigue. The results also provide a "benchmark" for methodology improvements as new data and information are obtained. Crack growth life analyses of particular geometry configurations are used to show the relative life impact of corrosion metrics. For example, typical surface morphologies generated by corrosion in a lap joint are evaluated. The local stress amplification due to the corrosion roughness reduced the regional crack growth capability of a surface crack by 70%. The impact of sustained stress build-up caused by corrosion-induced pillowing in a lap joint degraded structural life 25 to 35% for a crack adjacent to a fastener hole. These results represent the level of potential life degradation that could be realized in the corroded regions. The individual models isolate the contribution of effects attributed to corrosion (i.e., pillowing, surface morphologies, etc.) and analysis results emphasize the need to include corrosion parameters in a component service life assessment. A simulation of a pressurized fuselage skin splice is used to illustrate the analytically derived impact to the life and safety of the joint in the presence of corrosion. The analysis includes time-dependent effects of corrosion into the structural life prediction for a multi-site damage (MSD) scenario. Twenty and fifty year corrosion assumptions are used based upon conditions found in existing aircraft. The results of this analysis indicate that corrosion is a potential structural problem for the particular aircraft locations that are experiencing this type of corrosion attack. This paper presents the methodology for computing the effects of real time 'age degradation' on an aircraft structure. So it provides a means of using the existing Structural Integrity process to meet the needs, opportunities and challenges being presented by the aging aircraft fleet.

Author

Fatigue (Materials); Corrosion; Structural Failure; Aircraft Structures; Crack Propagation; Fracture Mechanics; Degradation; Surface Cracks; Aircraft Maintenance

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